Australian Personal Computer

Desktop Publishing Feature
Including PageMaker 3.0 review

ISSN—4115 NZ $6.30 INCL. GST
REGISTERED BY AUSTRALIA POST PUBLICATIONS VBP 3691

JULY 1988 $4.50

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

IBM's NEW PS/2s: CAN THE CLONES COMPETE?

Borland Sprint • ISDN Explained • TSRs with Turbo • Virus Vaccines

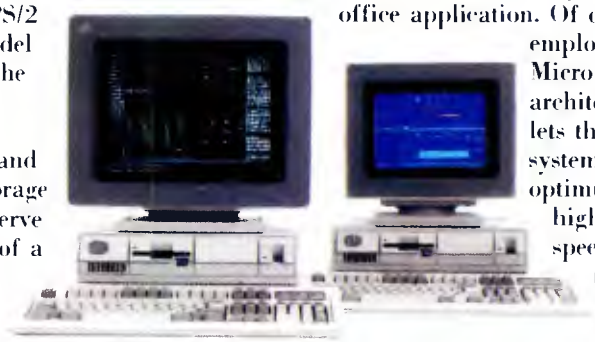
IBM Announces:

The newest members of the Personal System/ Desks never had it so fast.

Right for today, ready for tomorrow.
The IBM Personal System/2™ family is the fastest-selling computer line in history. And now the PS/2™ line has even more to offer with the addition of two powerful new desktop models, the Model 50Z and the Model 70 386. Both are designed to make the most of the software you use today. And both are optimised for advanced computing environments like IBM Operating System/2 (OS/2)™ that you'll want to use in the future.

The Model 70 386.
Our fastest desktop personal computer. The Model 70 386 is powered by an Intel 80386 running at speeds up to 25MHz.** depending on the configuration you choose. From high-resolution graphics to scientific calculations to computer-aided design, the Model 70 386 puts the power of a minicomputer on your desk. Under a multi-user operating system like IBM's new PS/2 AIX, the Model 70 386 has the speed, Micro Channel™ architecture and high disk storage capacity to serve as the heart of a network.

The Model 50Z.
Complex spreadsheets and large databases will benefit from the extra power we've incorporated into this new PS/2 model. At its heart is an Intel 80286 processor running at a brisk 10 Megahertz with zero wait states. What does that mean? In practical terms, it means the Model 50Z runs up to ten times faster than our original PC and gratifyingly fast for just about any office application. Of course it employs our unique Micro Channel architecture which lets the whole system make optimum use of the high processor speed in multi-tasking situations.



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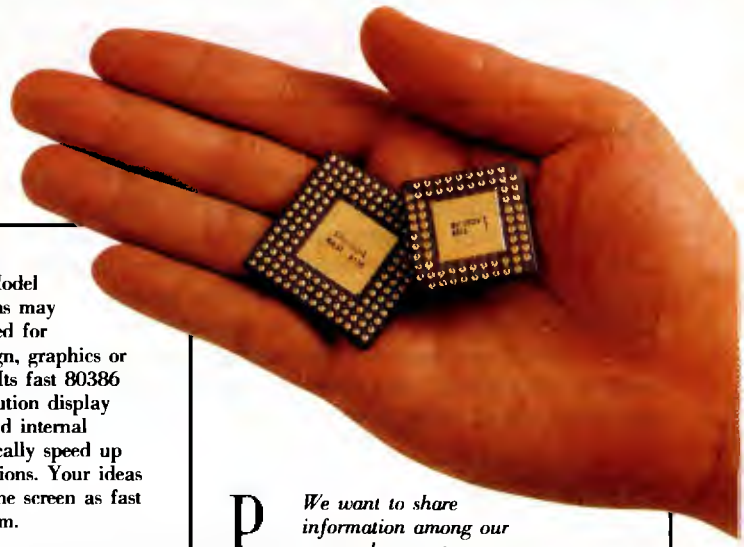
** Not all configurations available immediately. Check your IBM Dealer for availability.

Model 50Z
Two models. Intel 80286; 10 MHz, 0 wait states. 1Mb RAM (85ns) standard, expandable to 16Mb. Choice of two standard hard disks: 30Mb (39ms) or 60Mb (27ms), depending on model.

Model 70 386
Three models. Intel 80386 microprocessor: 16MHz, 20MHz or 25MHz (64Kb cache memory), depending on model. 1Mb or 2Mb memory standard, depending on model — all models expandable to 16Mb. Storage: one 1.44Mb 90mm (3.5-inch) diskette drive and one 60Mb fixed disk (27ms) or one 120Mb fixed disk (23ms) standard, depending on model.

2 family.



Problem Solution Seminar

P. *Spreadsheets are vital to our business, and some of them have grown huge over the years. Lately, we're finding that we spend far too much time waiting for recalculations. Also, our hard disk is always filled to the brim.*

S. You're clearly reaching the limits of your present personal computer. The Model 50Z can help you in a variety of ways. It runs several times faster than the Personal Computer AT and up to 10 times faster than the original IBM PC. With hard disk storage of up to 60 megabytes, you'll have ample capacity for even the largest data files.

P. *I make extensive use of computer-aided design on the job. Now, I'd like to do more complex and precise work, so I'm planning to acquire a CAD program with more function. I believe this program would run too slowly on our current PC and the larger files it creates would soon fill up our hard disk.*

S. One of our new Personal System/2 Model 70 386 configurations may be just what you need for computer-aided design, graphics or desktop publishing. Its fast 80386 processor, high resolution display options and optimised internal architecture dramatically speed up all graphics applications. Your ideas will take shape on the screen as fast as you can enter them.

P. *We're hearing about a new operating system from IBM that will allow the computer to process several jobs at once. Why would we want to do that, and what kind of computer would work best in that environment?*

S. IBM OS/2 is a new operating system that will allow programmers to put far more function into software, while at the same time making it easier to use. Its multi-tasking capability makes it possible for a computer to run several tasks at once. For example, you could write a note or sort a database while your spreadsheet recalculates. The PS/2 Models 50Z and 70 386 have been designed to take full advantage of OS/2. They have the fast memory access, disk capacity and internal architecture that will extract the maximum performance from the new software.

P. *We want to share information among our personal computers on some kind of network. We're looking for a computer with the capacity to store all our important data, and the speed to serve many users at once.*

S. Depending on what kind of network you choose, either of our two new PS/2 models would be an excellent choice. Fast processing speed, high-capacity fixed disks and a wide range of network options make both the 50Z and the 70 386 ideal nodes or file servers for a local area network. IBM Micro Channel architecture can speed up response time when several users need information at once.

With the addition of the Zero Wait State Model 50Z and the Model 70 386, the IBM PS/2 family can put top-of-the-line computing power on your desk more cost effectively than ever before. Of course like all IBM products, these new computers are serviced and supported through the strongest network of dealers in the industry.

To find out more about these and other members of the growing PS/2 family, contact your local IBM Authorised Dealer.

IBM

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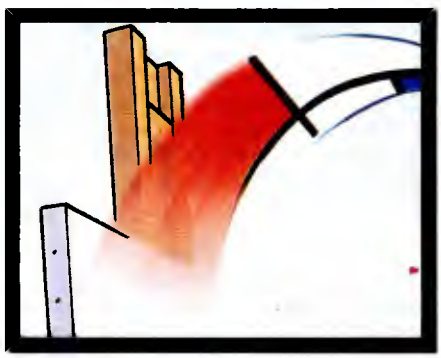

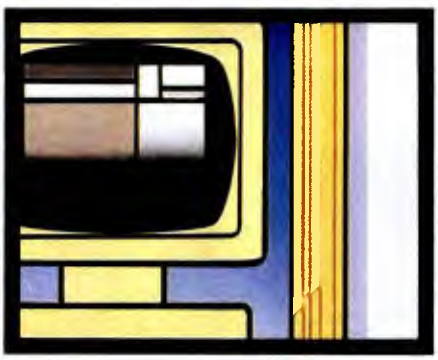

Managing Editor: Sean Howard; **Assistant Editor:** Cathie Kennedy; Consultant Editors: Steve Withers, Ian Davies. Advertising Manager: Mark Reiss (02) 264 1266; Vic, SA, WA and Tas Sales Manager: Wendi Fraser (03) 531 8411. **Production:** Graphic Heart Pty Ltd. **Circulation and Distribution Manager:** Imogen Boas; **Subscription Enquiries:** Kellie Coles (02) 264 1266; Standard subscription rates: Australia $54 per annum, overseas A$88 (surface) A$220 (airmail). Newsstand Sales: Network Distribution Co. 54 Park Street, Sydney 2000.

Publisher: Computer Publications Pty Ltd (a subsidiary of Consolidated Press (Holdings) Ltd) **Sydney Office:** 124 Castlereagh Street, Sydney 2000, telephone (02) 264 1266; telex AA 20514 CONPRES. **Melbourne Office:** 47 Glenhuntly Road, Elwood, 3184; telephone (03) 531 8411; telex AA 30333 'AMJ'. Printed by Quadricolor Industries (Aust.) Pty Ltd.

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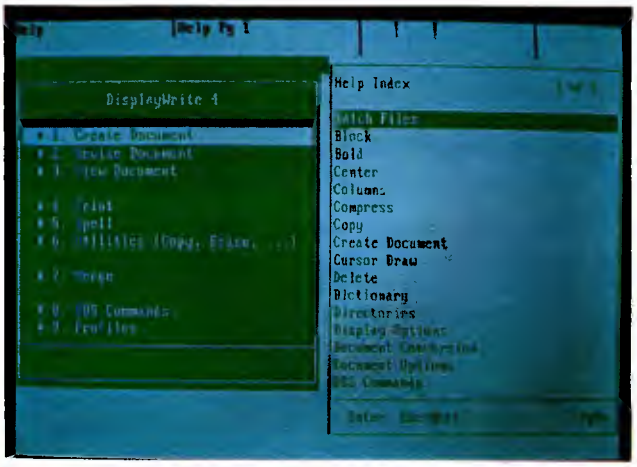

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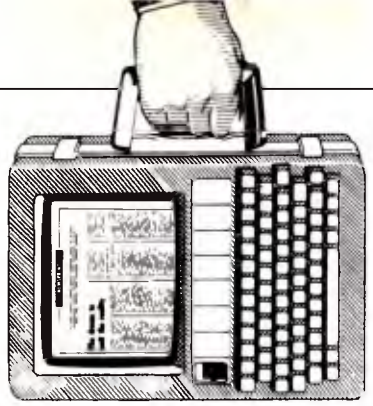

This month's news focuses on the highlights of Comdex, which was held in Atlanta in May. Guy Kewney, with a little help from associates, gives details of the products, and personalities, which caught his eye.

Amiga in business

Henri Rubin is 'The Boss' at Commodore. Under the guidance of Canadian chairman Irving Gould, Rubin runs the company. I found him in Atlanta, demonstrating an Amiga with several processors, all talking to each other. It looked fast. It was, he said — his own Amiga is fitted with a Motorola 68020 chip, among other things.

When you find Rubin, with his sleeves rolled up, demonstrating a new version of the Amiga operating system, it is time to admit that the company is, at last, taking this system seriously.

At Comdex, Commodore bragged of having sold more than 600,000 Amiga computers. Rubin, dextrously flicking his fingers over the keyboard and mouse of a model 2000, estimated that "somewhere between" 100,000 and 150,000 of those were the original model, now called the A1000.

That's a genuine installed base. And suddenly, the wisdom of my old friend Mike Lehman seems less foolish than it did a year ago. Lehman is a software hacker of the old school, and became something of a folk hero in CP/M days by writing a Pascal compiler. He was entranced by the Amiga when it appeared, and declared that he would produce a definitive series of business programs for it. They'd be called Maxi. MaxiPlan would be the spreadsheet, MaxiWord the editor, MaxiCom the communications link, and so on. "I will be the first, and if the machine succeeds, I'll make a fortune," he said. He disappeared into a mid-California retreat with his equipment.

That was two years ago, and I'd given up hope. Word from Pebble Beach, Monterey, suggested that he'd run into serious problems. His publisher (Electronic Arts) complained of chronic lateness.

To my delight, the program which Rubin trotted out to demonstrate the power of version 1.3 of AmigaDOS turned out to be Lehman's spreadsheet — and it worked!

Lehman's theory was simple enough. On a multitasking machine (the Amiga is still the only one around that is actually equipped with software) one program can swap information, while it is running, with another.

Rubin demonstrated this quite effectively, in Atlanta. But he went one better — he managed to get two programs on two different processors to swap information.

The trick is done by running Lotus 1-2-3 in the PC bridge, passing information to another program in the Amiga environment. And it's quite a trick. "In the Amiga environment, I can write a task in one of its windows, which could take command of the package as if it were a user," said Rubin.

Friends of the Amiga will realise that the machine Rubin was using can do things that current machines cannot do. Most of this is because of the new operating system, which he predicts will be on test for the next three months and available in September.

I was particularly impressed by the fact that the PC and Amiga sides were using the same hard disk. So, for that matter, was Unix. All three systems are in the system partition, and all data is kept in the data partition.

Unfortunately, you can't multi-task Unix, PC-DOS and Amigados — at least, not yet. It is planned, says Rubin. But at the moment, the other two operating systems close down when you load Unix.

Somebody just had to try it sooner or later. In conjunction with United Directory Systems (UDS), Philips has released a compact disc containing 'millions' of Australian business and residential names, addresses and telephone numbers, according to a company spokesman.

In the never-ending search for an excuse for PC users to purchase CD-ROM drives, Philips came up with the idea of squashing existing printed directories into a single disk. Touted as a marketing tool rather than an electronic telephone directory, the so-called 'Australia on disc' contains 2.5 million separate records, and incorporates an Australia-wide business directory, as well as residential directories for Sydney, Melbourne and the ACT.

Priced at $852 for the disk, or $2142 bundled with a Philips CD-ROM player, Philips claims that the included Textware text retrieval software allows even novice PC users to easily access the 608Mbytes of data. Textware was developed by Unibase in the US, and provides simple and powerful search facilities, according to officials. Once users are convinced of the value of such a product, Philips and UDS plan to provide yearly updates of 'Australia on disc', which will be available to existing owners at a price yet to be determined.

This system is no home micro. The plug-in 68020 board comes with four megabytes of 32-bit high-speed memory, and the hard disk is big and fast and pre-configured.

Rubin says that programmers inside Commodore are moving off their Sun workstations, and doing the Unix work on this beast. I'm not altogether surprised: the system of windowing and control comes as a pleasant surprise to a confirmed Unixphobe. And an Amiga is cheaper than a Sun. And I dare say engineers who opt for the company's own product don't suffer from corporate derision for doing so . . . but I think most of the rest of us will probably stick to a slightly less ambitious machine for a while.

Guy Kewney

Viewing the future of OS/2

Bill Gates doesn't fool me. He may be a billionaire when the market is high, he may be the richest programmer in the world, and he may have IBM following him around like a procession after a priest, but he doesn't know what the future of IBM is — or what is going to happen with OS/2 — any more than I do.

The most significant event at this year's Comdex show in Atlanta was one which didn't happen there. It happened a week or so before, when IBM announced the re-establishment of a mainframe operating system, DOS/VSE.

There is no reason why you should have heard of DOS/VSE, so stand by for a little history. As you read, try to remember that this all happened 20 years ago.

Long ago IBM invented a machine called the 360 and shortly after, invented disks to go with it. To let software use the disks, IBM invented a disk operating system — not MS-DOS — just DOS.

A few years later, people started running out of memory.

Amidst the usual irrelevant bright lights and dancing girls, local Compaq subsidiary CCA Systems revealed its rapid response to IBM's PS/2 Model 70 — the faster Deskpro 386/25, the P9-based Compaq 386s and severe price cuts on its existing range of up to 30 per cent.

Compaq always likes to emphasise its 'world firsts', and this launch was no exception. By shipping the Deskpro 386/25 immediately, Compaq became the first company to officially deliver a true 25MHz 80386-based PC. (IBM's 25MHz Model 70-A21 ships later this year). At the same time, the company also unveiled the world's first systems based on Intel's new 80386SX CPU (also known as the 'P9').

Not content with beating the Model 70, Compaq's Deskpro 386/25 is also claimed to out-perform workstation offerings from Sun Microsystems and Apollo. Both 386/25 models use an 82385 cache controller chip and 32k of static RAM to boost performance, and support up to 16Mbytes of RAM. The 386/25 can support the new Weitek 3167 (Abacus) coprocessor, along with the usual Intel 80387, and even runs the two simultaneously.

Somewhat misleadingly, Compaq officials also crowed about breaking the 'Gigabyte Barrier' with a new hard disk option — an expansion chassis that allows four standard 300Mbyte units to be daisychained together.

The $6149 Deskpro 386s, available in three models that sport various hard disk configurations, is based on Intel's 16MHz 386SX chip, an 80386-compatible CPU with a 16-bit data bus. The Deskpro 386s includes a 5.25in floppy drive, 1Mbyte of memory (expandable to 16Mbytes), four expansion slots, a Video Graphics Array graphics controller and high-speed memory slot.

In the same announcement, Compaq quietly killed off three older models and cut the prices of others to incorporate the new machines in its range. The models dropped were the Deskpro Models 1 and 3 and the Deskpro 386/20 Model 300.

The answer to this was not the Lotus/Intel/Microsoft (LIM) extension to memory, but Virtual Storage, and IBM set about writing a vast, virtual storage operating system, which could run programs bigger than the machine.

Virtual storage is simple: it loads part of your program from disk and when that part is done, it loads the next bit. You didn't have to write the program (the theory went) in overlay sections. Just produce a big chunk of code, and the computer will fit in as much of it as it has space for.

We'll skip grandly on, ignoring the many problems that this caused, and how they were solved. Simplifying horribly, we'll just add that Multiple Virtual Storage was the same thing on a grand scale. It would share the machine with other programs. Your program would run as long as it took to prepare a line of print. Then, while it was waiting for the printer to clank into action, it would load someone else's program in, and run that. Clever. Especially with memory costing several hundred thousand dollars per 64k module.

Anybody who was anybody promptly announced that they were switching over to MVS. Only goons kept on running DOS. And IBM warned its customers that DOS didn't really have a future. They needed the power of MVS.

It became apparent that there were too many goons. IBM had to produce a virtual storage extension for DOS. DOS/VSE, in fact.

Gates is too young to remember all that, but I'm sure IBM has told him the story. The parallels with today, as PC-DOS is declared obsolete (well, there are those of us who have maintained for ages that it always was!) and OS/2 is *the* way to go . . . well, it's obvious, isn't it?

This didn't stop Gates telling everybody, at the Atlanta Comdex show, that the future was OS/2. Why should it? If he doesn't go around preaching, nobody else will believe.

His company, Microsoft, had a pulpit provided by IBM for the purpose. On the IBM stand, there was the sort of massive display, typical of Comdex exhibitions, of hardware and systems. On

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- Lotus 1-2-3
- Lotus Symphony

132 column Mode

- Framework II
- Word Perfect v 4.2
- WordStar Release 3.30
- WordStar Professional Release 4
- Lotus 1-2-3
- Lotus Symphony.

Computers Supported

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How vaccine programs work

Virus programs replicate themselves. Run one and it will infect other programs on your system. Share one of those programs with friends and the virus will infect *their* systems.

If it did nothing else, a virus would still slow your work. Each infected file grows, sometimes repeatedly, so it loads slower. But most viruses include added malicious features. After they've infected your whole system, or on a given date, they may reformat your hard disk, corrupt data files, or simply cause constant small problems.

Anti-virus programs attempt to foil viruses by keeping them out of your system, preventing them from replicating if they *do* get in, and blocking their malicious tricks. A good anti-virus will also protect against 'Trojan Horse' programs — these are like viruses without the ability to replicate. And it will protect you from *accidentally* damaging your data.

Anti-virus programs work on many different levels. Some common techniques include the following.

Keeping viruses out

- *Approved program list:* Block any program not on the list. Naturally, this doesn't stop you from accidentally approving an infected program.
- *Known virus check:* Scan all executable files for known viruses.
- *Suspicious text search:* Display all text strings in a program. If you see 'Arf, arf, GOTCHA!', don't run it!
- *Suspicious Code Search:* Check for suspicious commands such as low-level disk writes.
- *Approved TSR list:* Warn if any program not on the list attempts to terminate-and-stay-resident.

Preventing replication

- *Write-protection:* Prevent writing to protected files. This should be more than merely setting the Read-Only flag.
- *Signature check:* Take a 'signature' of all approved programs and compare the program with the signature.
- *Run-time signature check:* Whenever DOS loads a program, check it against the signature. Block it if it doesn't match.

Blocking malicious tricks

- *Disk access lockout:* Allow access only through DOS file functions. This will prevent reformatting and erasure of the File Allocation Table.
- *FAT copy:* Save a copy of the File Allocation Table in case a virus manages to damage it. Various 'unformat' programs already provide this protection.
- *CMOS copy:* Save a copy of the CMOS information just in case a virus does manage to damage it.
- *Hard disk lock:* Temporarily block all access to the hard disk while testing suspect software. Easiest to do on AT-class machines.

of black humour. But the sceptics are wrong.

Computer viruses, written specifically to destroy programs and data residing in personal computers, are real and have been widely distributed. Many PC users have lost important work, at substantial cost.

Viruses do exist

The bad news: they can represent a clear and present danger to the programs and data stored on your computer's disks. But there's good news: you can avoid viruses through reasonable measures, and counter-viral products are available to help detect viruses lurking on your disks and to protect against future infections.

Kenneth VanWyk knows computer viruses are real, because he's been fighting them. A senior consultant for a university computing centre, VanWyk has seen hundreds of IBM PC users' floppy disks erased by a runaway virus launched by a computer vandal.

"This thing was discovered about two days before the break last autumn," VanWyk recalls. "If some students had not discovered it then, and people had gone home for the break, it could have been a lot worse. Because if students had taken infected floppy disks home with them it could have gone a lot farther ... to their home machines, and from there, with

COMPRESS.ARC This trojan, dated April 1, 1987, destroys FAT tables. COMPRESS is executed from a file named RUN-ME.BAT and is advertised as a 'Shareware *ARC* from Borland'.
DISKSCAN.EXE This was a PC Magazine program to scan a hard disk for bad sectors, but then a joker edited it to WRITE bad sectors. Also look for this under other names such as SCANBAD.EXE and BADDISK.EXE.
DMASTER Another FAT scrambler.
EGABTR The description of this program is reportedly 'improve your EGA display', but when it's run it deletes everything in sight and prints 'Arf! Arf! Got you!'
FUTURE.BAS Scrambles FATs and erases files.
NOTROJ.COM This program appears as a useful utility used to fight other trojans. However, it reportedly is a time bomb that erases any hard disk FAT table that it can find, and at the same time warns: 'another program is attempting a format, can't abort!' After erasing the FATs, NOTROJ then proceeds to start a low level format. Note that NOTROJ only damages full hard drives; if a hard disk is under 50 per cent filled, this program won't touch it.
RCKVIDEO After showing some simple animation of a rock star, the program erases every file it can lay its hands on.
SECRET.BAS Beware! This may be posted with a note saying it doesn't seem to work, and would someone please try it. If you do try it, however, it will format your disks.
SEX-SNOW.ARC This trojan deletes all of the files in your directory and creates a gloating message using those filenames. Ugly.
TIRED Scrambles FATs.

The cure for viruses is earnestly sought but the perfect defence is yet to be developed. The essential reason for this is that whenever a defence mechanism is established a virus can be written and installed to bypass that particular defence mechanism. As influenza continually mutates to new strains so can the computer virus.

A prominent US BBS operator, Ted Landberg, has published a sound checklist of measures that computer operators might take to minimise the risk of viruses and trojans. These steps are non-technical and just good common sense:

- **Education** Computer users should be told about the reported existence of Trojans and Computer Viruses, what

continued ...

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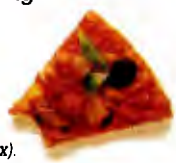

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notice a hissing noise. Then more clicks, buzzes, and whistles. Then maybe a clear and silent line again.

Two modems whistling at each other down that line will quite possibly be able to swap data at 9600 bits per second when it is perfectly clear. As the noise gets worse, however, they will find themselves swapping garbage.

With a really bad line, it is possible that even a 300 bits per second modem will have trouble — but such lines are rare. More typical is a line which will run perfectly well at 1200 bits per second, with occasional bursts of data loss.

The standard copes well with this. The data that gets corrupted is re-transmitted. Overall, the effect is that data slows down for a second or two. For real high-throughput working, you need something that constantly examines the line and switches speeds up and down.

US Robotics, maker of the Courier HST modem, is clearly ahead of its rivals in this area, with the possible exception of the Trailblazer supplied by NetComm in Australia. Under most circumstances, the Courier or the Trailblazer can transmit data at close to 15,000 bits per second, using various tricks. If the line deteriorates, the modem just slows down for a while until it improves again.

The problem is that none of these methods is used by more than one manufacturer. Just the situation where the CCITT, the standards body, ought to have issued guidelines.

I said there were two problems: the second is the wider one of what the data travelling between the modems means.

The LAP-M standard deals simply with a data stream. Theoretically, it is part of the full X.25 system, and so you can do clever things with the data at each end — for example, split it into two (or more) streams. Say you run at 2400 bits per second — you could insist that a third of this is devoted to downloading a file, while the rest is available for searching through the database.

My own opinion is that some of this virtual circuit thinking could (and should) have been attached to the standard. Experts tell me I'm wrong, because this would limit some applications, and I accept that this is true — but I also feel that the days of using analogue phone links for data are limited, anyway.

More importantly, I think there is one particularly horrible hole in data transmission between computers which should have been patched. This is the question of what you do when the line drops.

At the moment, when you ask for a file to be transmitted between two machines, you are at the mercy of the telecoms authorities. A file of 50 bytes, for example, may be a program. If the last six bytes are missing, it probably won't run.

If you have downloaded 49 bytes when the line goes dead, the only way of getting those extra bytes is to start the whole file again. This isn't just silly, it's unnecessary.

When I was a CP/M user, the standard way of transmitting a file between two machines was not Xmodem, Ymodem, Zmodem, Kermit or CompuServe B. It was Bstam. Connect two machines that both have Bstam and, no matter how often the line drops, they will persist in exchanging the file until it is all there — with no missing bits, no gaps, and no corruption.

Taking the view that this was an area for the data users to sort out, the CCITT didn't include a file transfer protocol in its standard.

It's a valid viewpoint, but one which, I am sure, we will come to regret many, many times over the next five years. I think it's a standard we definitely need.

Guy Kewney

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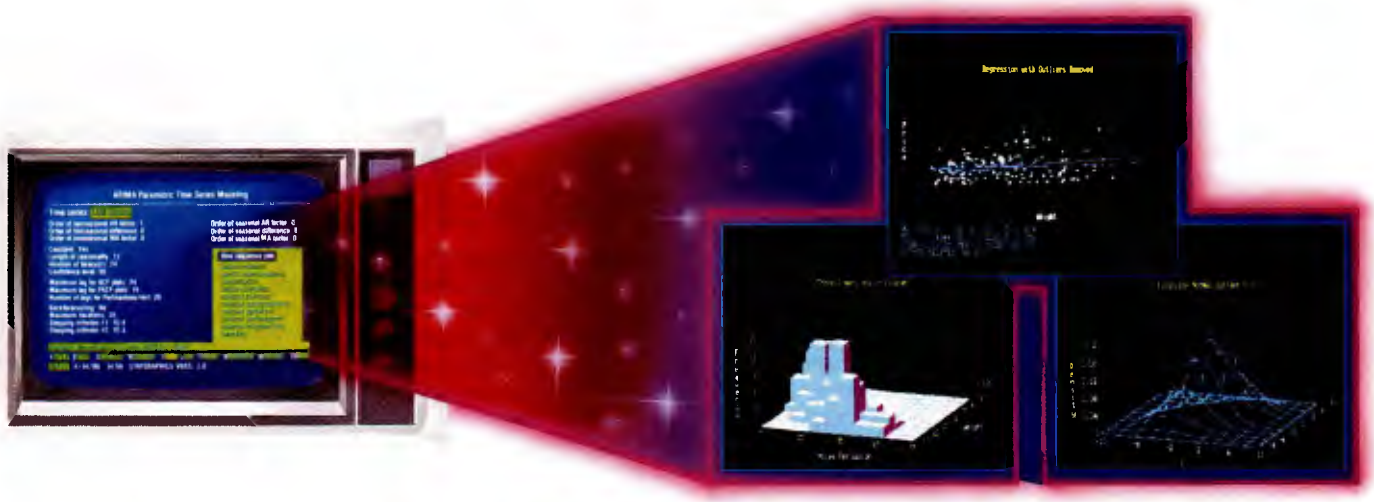

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First PM?

Micrografx claims that its PM-Draw — business drawing and clip art — program is 'the first OS/2 application to use Presentation Manager'.

This program was on display on the IBM OS/2 bonanza bazaar at Comdex and, like most stuff there, was more vapour than substance.

The company claims it was the first software developer to ship a Windows-compatible application, when In*a*Vision, a drafting program, shipped in July 1985. Price was not public at Comdex.

Micrografx is something of an expert in managing Microsoft's windowing interfaces, however, so I'm not overly sceptical about this product. The company also sells Designer, Graph Plus, and Windows Draw. Its products are distributed locally by InfoMagic in Sydney.

Into the future of spreadsheets with WingZ

Informix Software's WingZ caused a great deal of excitement and hilarity. Show visitors queued to enter the WingZ time capsule and join Leonard Nimoy (this time without his Dr Spock pointed ears) on a video and Mac monitor-based visit to the future of spreadsheets.

WingZ is a Macintosh worksheet-based document processor — that is, a very powerful Excel-like spreadsheet, but with many more capabilities than Excel. Some comparisons with Excel prove the point (see Comparison box below).

Charts can be incorporated into the worksheet rather than being stored as separate documents. This means that a complete set of tables and charts can be output as one document. It is also possible to define 'buttons' which appear onscreen and which activate macros when clicked. Menus and dialogue buttons can also be created by the user. Price is under $US500.

The reason for the time-capsule approach to demonstrating the product is that it will not be shipping until around September.

Derek Cohen

More modems

As Comdex takes place in Hayes' home town, it always puts on a big stand and an even bigger party. While last year's stand saw the launch of Hayes' V-series high-speed modems, this year the main emphasis was on ISDN. (More details of ISDN can be found in 'The ultimate link' on page 111).

Also on the stand was a demonstration of Prodigy, the viewdata service set up by IBM and retailing giant Sears for which Hayes has designed a special low-cost modem. The basic purpose of the system is to provide armchair shopping facilities, Sears' main interest.

The graphics are far superior to Viatel's but the dialup software is limited at present to IBM PCs and compatibles (I wonder why?).

As Prodigy is aimed at novice users of computers there is no numeric paging system, and routing is achieved through menus and visual metaphors of buildings and floors and rooms. While good initially, I found it frustrating when I knew exactly where I wanted to go. The people demonstrating the system were very vague about the possibility of third parties providing information, although a number of retailers have so far joined in. Mailboxing facilities for sending messages to other users may or may not exist.

All of a sudden Viatel and Microtex seem so much more civilised.

Derek Cohen

	WingZ	Excel
Worksheet size	32768 x 32768	16384 x 256
Built-in functions	180	94
Colours	16 million	None
Chart categories	20	7
Database sort keys	256	3

WingZ/Excel comparison

HardCard inventor Plus Developments is another company having a stab at the removable hard disk market. Its Passport device has a number of advantages over Tandon's Pac. Each Passport holds a 20 or 40Mbyte 28ms RLL drive with a 1:1 interleave, allowing the data to travel as fast as the main computer processor wants. The housing will fit into a standard half-height 5.25in drive chassis and will thus work in any existing PC, AT or '386; alternatively, external models are available. The units need their own drive controller, which is available in both PC and MCA bus formats. Each controller can run two Passport drives.

Prices vary according to storage size and for which machine models are designed, but as a guide, the 20Mbyte internal unit for the PC sells for $2717.
Derek Cohen

Mac Gofer

Easily the most powerful tool I have for searching through my totally disorganised PC hard disk is Gofer. Now it's available on the Mac, from Microlytics.

Microlytics has a connection with Rank Xerox's famous Palo Alto Research Centre (PARC) which originally gave us the Smalltalk interface, and there is some fiercely powerful software technology being developed there today. Gofer is one of these.

It searches through files for words, phrases, or near-matches. On the PC, its speed is astounding. On the Mac, I have yet to be convinced it can cope with the

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relatively slow SCSI and serial network interfaces, and I look forward to doing so.

It can, however, read almost any Mac file, and it works with Multi-Finder. The only annoying aspect of this product is that no Australian distributor has had the nous to pick it up. For now you'll have to order it direct from the US.

Guy Kewney

Ventura ventures forth

Xerox's two stands were devoted entirely to Ventura Publisher. On one stand the company was signing up dealers for its VAR program whereby dealers undertake to train customers and configure specialised systems. The other housed some 30 companies providing hardware and software add-ons for Ventura Publisher.

LaserGo

Many people envy the typographical effects possible using PostScript as the page description language. While cheaper PostScript-driven printers are emerging now, and some cards which will allow PostScript files to be printed on other laser printers, owners of more common dot-matrix and ink-jet printers have been ignored.

GoScript is a $US195 utility which converts PostScript files into print files for Hewlett-Packard's LaserJet and DeskJet, the Canon BubbleJet, the IBM Pro-Printer and Epson's FX and LQ printers. Features supported include font scaling and rotation, and page description language graphics.

Depending upon the memory available, GoScript will create a print file in either LIM expanded memory or on a hard disk. The resulting file is then sent to the printer from DOS. While this makes for a somewhat clumsy and time-consuming affair (LaserGo estimates at least 10-15 minutes for complex pages) it is a far cheaper solution than buying a PostScript printer, especially when you consider that the price includes 13 Bitstream PostScript font outlines.

Australian distribution is still under discussion but LaserGo is in the US on (619) 530 2400.

SoftCraft

One of PostScript's features is the ability to rotate, shadow, shade and generally manipulate fonts. SoftCraft's $US95 Font Effects package allows you to do the same for Hewlett-Packard compatible fonts. Among the effects included are drop shadows, shading, a number of outlining styles, reverse print and emboldening. Other packages from SoftCraft include a font editor, and a range of downloadable fonts for special purposes such as display and screen use.

SoftCraft is on (608) 257 3300.

Derek Cohen

IBM'S addition to its mid-range line: the AS/400

Not Silverlake, not Olympus, but AS/400!

IBM has launched its long-awaited AS/400 series of midrange computers, previously referred to by the code-names 'Silverlake' and 'Olympus'. The new range represents a major step towards the full implementation of IBM's Systems Application Architecture (SAA). These machines will allow users to build a full SAA system with PS/2s, once the OS/2 Extended Edition becomes available. Users will enjoy common terminology, screen layouts and menus across both applications and systems. IBM also revealed that RPG is to be the common language interface for SAA and an OS/2 version of RPG was being prepared for the PS/2 range.

The AS/400 family consists of six machines, from the entry-level compact Model B10 (with up to 16Mbytes of memory and 76 users) to the Model B60 (with up to 96Mbytes of memory and 200 users). Prices for a basic system, including hardware and software, range from $100,000 to a measly $1.7m.

PCs can run under AS/400 Office, once fitted with a 5250 emulation card.

DAT's what the Japanese like

The Japanese inventors of Sharp's DAT (Digital Audio Tape) storage system were very pleased with themselves. Their system is designed to be the same size as a full-height 5.25in disk drive and will use standard interfaces such as PERTEC and SCSI to interface to the host computer. A 120-minute DAT cassette will be able to hold 1.2 gigabytes of information with a search time across the tape of 40 seconds. Clever placing of the system information at the edges of the diagonally-scanned tape means that file searches can be made at 50 times the normal playing speed.

The unit uses four heads, two read, two write, and a read after write protocol to ensure absolute data integrity. The makers were wary of quoting either price or delivery dates but were so fascinated by my miniature laptop that they exchanged the price ($US6000) and delivery date (end of 1988) for a go at it.

The reason for the inventors' great pleasure may have been that they had just seen Hitachi's prototype DAT storage system. The box is about as large as a standard IBM AT and even the production model looked too large ever to be available as an internal device.

Derek Cohen

Hitachi in full colour

By the end of the year we may well start seeing laptop computers with colour LCD screens. The prototype shown in a Hitachi laptop ran 16-colour CGA graphics. The display measures 6.5in diagonally with a resolution of 640 by 600.

Each pixel is created by three transistors which create red, green and blue masks over the backlight. Conventional LCDs are multiplexed which causes a perceptible flicker, but Hitachi's colour screens use thin-film technology with each pixel operating as if it were a static device. This produces a very high-contrast ratio.

Hitachi sees no problem creating displays to VGA standards. To create the various shades of colour, the system refreshes the different transistors at different rates.

One existing application for Hitachi's display is in a flat-screen TV, recently on sale

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in the US for $US800. This is unlikely to appear in Australia as it operates on the NTSC TV standard common to Japan and the US.

Another advantage Hitachi claims is that the display operates as a digital device but can provide analogue performance, eliminating the need for special analogue video drivers. Nonetheless, it is likely that special software drivers will be needed to get the most out of the displays.

As Hitachi supplies its displays to Zenith, and Zenith is keen to maintain its lead in the battery-powered laptop market, we could see a colour Z183 in the next 12 months.

Derek Cohen

Xtree updated

Xtree is probably one of the most-used directory managers for MS-DOS machines. Its new incarnation — Xtree Pro — improves on the original with greater speed and the ability to hold multiple disk directories in memory at one go.

Fortunately for experienced Xtree users, the only changes to the interface have been to bring its function key usage into line with other DOS programs. So, ESCape now cancels an action, rather than F3, and 'Q' quit rather than F1. Help is now on the ubiquitous F1 rather than F2.

Derek Cohen

The Fastwire II serial/parallel file transfer utility, available locally through Micro Support Systems, is claimed to be "the first in its class to break the 115,200 baud serial port speed barrier." Fastwire II supports networks and the IBM PS/2 range, and features a 'turbo parallel port mode' providing for the transfer of data at over 500,000 baud, while a similar 'turbo mode' for serial transfers is claimed to support data transfer rates of over 200,000 baud.

A 'smart cable' used by Fastwire II automatically works out whether serial or parallel ports are linked, and the controlling software includes full diagnostics and context-sensitive help. A variety of control modes are supported by the $225 Fastwire II, including split screen, form and command modes.

The package features a block transmission test, which determines the raw transfer rate between two PCs. A Fastwire link between two Compaq Deskpro 386/20 units, for example, clocks in at 21,000 bytes per second in serial mode and 53,000 bytes per second in parallel mode.

Teach your micro to read

Scanners and character recognition are starting to be available for a large number of fonts, and the big problem remains: what do you do when you want to read a book into your system, but the machine doesn't understand this particular font?

The answer is: teach it. The program which does this is Flagstaff Engineering's SPOT. You're meant to imagine a highly intelligent Dalmation dog, attentively watching His Master's Font. In fact, it's an acronym for Syntactic Pattern Optical Translator.

It works very simply, by looking at a scanned page and asking you what each character is meant to be. It can cope with typewritten characters, typeset characters, proportionally spaced characters, kerned characters, and ligatures of up to three characters.

Several experts assured me, after the show, that it wouldn't work, because the definition of 'what is a character' required more attention, but I watched Flagstaff personnel train it to a new font. It took time, admittedly, but it worked.

The company claims a 99.9 per cent recognition rate, once you have it trained.

Details are available from the company at 1120 Kaibab Lane, Flagstaff, Arizona 86001

Guy Kewney

Look out, SQL

Although we've been told that the database interface of the future will be based on the Structured Query Language, some experts predict that the relational database model and SQL will be severely challenged within the next five years by object-oriented databases. According to Professor Rowe of the University of California at Berkeley, the relational database model is fine for traditional business applications but inadequate for databases used for CAD, scientific, and engineering applications. Relational databases are suitable for applications requiring a small number of data types and a fairly simple set of relations. But they are not well suited to databases involving new data types, such as graphics and other complex objects, and many relations with small numbers of rows, Rowe says.

Rowe and a team of graduate students are working on a different type of database, which they call "Post-Ingres," that lets users add new data types and customise indexing methods depending on the application. The database will also have forward and backward-chaining rules for expert-system applications.

Post-Ingres can store 'objects', such as a graphics image or a forms specification, as a record in the database, based on an 'object ID number'. Objects can be shared by multiple databases. The approach Rowe and his cohorts are developing will make it possible to compile frequently used queries and also store them by ID number in the database. Thus, an application program could execute 'query #47', which could be a compiled binary record in the database, for example. This would improve performance of complex queries greatly.

Post-Ingres will also give users access to historical data stored on optical disks, researchers say. In fact, the system will support a three-level hierarchy of storage — hard disks, tapes, and optical disks — allowing transparent data access on all three types of media. This capability would be extremely useful for accessing histori-

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cal data, such as archived medical or legal records.

'Next-generation' database systems will appear within three to five years and will be developed using object-oriented programming and window interfaces on graphics workstations, Rowe predicts. Alphanumeric terminals eventually will be replaced by graphics workstations for most database applications, he added.

Video key to colour printers

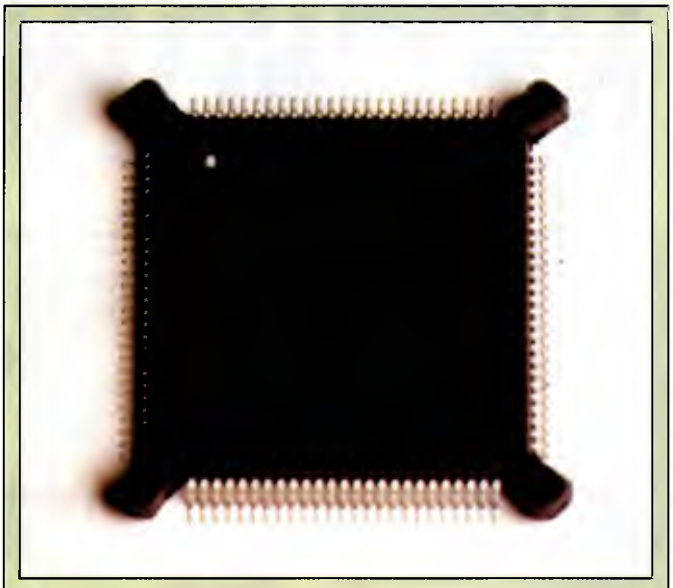
Forget that serial or parallel port connection for your printer. To get the state of the art in colour printer technology, you soon may be hooking up your computer's video output directly to the printer.

Sony has developed a thermal-transfer colour printer that, while designed primarily for broadcasters who want still photos from videos, offers a tantalising glimpse of where colour printer technology is going.

The Up-5000 does have an RS-232C port, but it's used for picture editing and control, not for carrying the actual print data. The interface digitises 8 bits of video and can print 256 variations of each of the three primary colours (magenta, yellow, and cyan). That amounts to something like 10 million possible colours per pixel.

The printer captures images in an internal buffer and stores up to two frames. You can view the image on a colour monitor and adjust the colour and tones under computer control. A full-size print from the UP-5000 is 6 by 4.5in, and the unit will also do overhead transparencies. It takes 67 seconds for it to do its work on each print using special colour thermal paper, and you can print multiple copies from the frame buffer.

Print quality is stunning — virtually indistinguishable from a commercial colour print, not at all like the muted colours from most of today's colour computer printers. As you might expect, though, it's not cheap. The UP-5000 will sell for around $10,000. But a Sony spokesperson said he expects the cost of the technology will fall dramatically in the next couple of years, bringing this type of colour printer within the price range of individuals and small companies.



As a long-expected conclusion to one of the computer industry's worst-kept secrets, Intel has officially released details of its P9 project — a stripped-down, cheap 80386-style microprocessor officially dubbed the 386SX.

The 386SX chip is supposedly identical to Intel's 80386 CPU in all regards except its smaller size, 16MHz clock speed, 16-bit data bus and 24-bit memory address. The 80386 chip, with a maximum 25MHz clock speed, has a 32-bit data path and 32-bit memory addressing capability. However, the 386SX is currently only available in surface mount format, effectively limiting its implementation to the larger PC manufacturers.

These differences will reportedly allow compatibles makers to price 386SX-based computers at up to 20 per cent less than 80386 systems, while maintaining compatibility with 32-bit software such as Microsoft's Windows/386, Borland's Paradox 386, Unix System V/386 and a future 32-bit version of OS/2, said Intel officials. The difference in address buses means the 386SX has only 16Mbytes of addressable memory, compared to the 80386's four gigabytes.

PC buyers keenly awaiting less expensive 80386 systems should have their wishes granted before Christmas, as over 50 manufacturers are claimed to be developing PCs based on the 386SX, including IBM, AST Research, NEC and Zenith. And of course, it was Compaq which took the 386SX line honours with the recent Deskpro 386s announcement.

While the 386SX will open the door for less expensive and smaller PCs, upgrading existing 8086, 8088 and 80286 PCs with accelerator boards using the new chip will probably not be an option for most buyers. "People buy accelerator boards to increase software performance, and the 386SX doesn't give that much improved performance. For accelerator boards, there are better products," said an AST official.

Open Windows

Microsoft has added over 50 new functions and messages in version 2.0 of its Windows Software Development Kit. The new version includes a Snap utility that lets you specify and print portions of the screen. A new Spy utility lets you examine messages sent by Windows to your application. Also added is a floating-point maths library that checks for the presence of and utilises floating-point maths coprocessors.

The kit includes a dialogue editor, which enables you to design dialogue boxes and save definitions. An icon editor allows you to create icons, cursors, and bit maps. With the font editor, you can create custom fonts.

Windows Software Development Kit 2.0 runs on the IBM PC and compatibles with DOS 2.0 or higher, 640k bytes of RAM, a graphics card, and a hard disk drive. It comes on both 3.5 and 5.25in floppy disks.

Mac DA for programmers

If you program on the Mac and spend a lot of time leafing through reference manuals, The Programmer's Online Companion 2.0 for the Macintosh may help. Based on Inside Macintosh, volumes I-V and the Apple Numerics Manual, the desk accessory includes frequently used system calls, system globals, and assembly language equates. You can modify and add information to the database.

The Programmer's Online Companion 2.0 is designed to be a crib sheet, not a teaching tool. For example, it does not teach what a 'clip region' is, but assists you in accessing and modifying one. The desk accessory assumes you know Pascal or assembly and are familiar with Inside Macintosh.

Developed by Steve Capps, a member of the original Lisa and Mac design teams at Apple, the program

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takes up less than 10k of RAM.

The Programmer's Online Companion 2.0 runs on the Mac 512E, Plus, SE, and II and sells for $69 from Addison-Wesley, tel: (02) 888 2733.

Quark's new colours

Among the additions to version 2.0 of XPress, a desktop publishing program, are support for Pantone colours and colour mixing and separation capabilities. You can shade colour pictures in one per cent increments, and you can also define contrast curves for hue/saturation/brightness; RGB; and cyan, magenta, yellow, and black. The program also lets you display and print colour TIFF (Tag Image File Format) files.

XPress 2.0 now lets you cut, copy, and paste hierarchical collections of text and graphics boxes (including their contents and borders) between pages or documents. You can perform searches on combinations of text and text attributes (including font, font size, and text style), and replace text strings with specified text/attribute combinations.

Hierarchical menus also are added in XPress 2.0. You can import MacWrite, Microsoft Word, WriteNow, Microsoft Works, and ASCII text files. In addition, the desktop publishing program supports TIFF, encapsulated PostScript format, PICT, and bit-mapped graphics files.

XPress 2.0 runs on the Macintosh Plus, SE, and II. It will be available in August from Laser Peripherals, tel: (02) 905 0050.

Mac System and HyperCard upgraded

Apple Australia has started shipping System 6.0 with all Macintosh computers. System 6.0 is an intermediate release between MultiFinder (released late last year) and the nirvana-like System 7.0 (due at the end of the year), which is slated to be the major upgrade that will move the Mac operating system to 32-bit operation for graphics, colour and memory management.

System 6.0 includes Andy Hertzfeld's QuickGraf routines to accelerate QuickDraw operations, and three INIT utilities known as Map, CloseView and MacroMaker. Map is a utility that calculates location and time differences between places on a world map. CloseView provides a magnified view of the Mac screen and MacroMaker supports keyboard macros, but both are fairly mediocre, and unlikely to affect sales of similar third-party programs.

One reason for System 6.0 is a revision of the QuickDraw code for generating large polygons, as glitches were discovered with the release of Apple's QuickDraw driver LaserWriter. HSC, when the generation of large polygons at 300 dots per inch caused serious memory problems.

A new release of HyperCard is also included with System 6.0, offering quicker and smoother performance, along with support for locked volumes — essential for CD-ROM and network stacks. HyperCard 1.2 also offers 40 enhancements to HyperTalk that provide stack designers with easier access to scripts and greater control over string searches and card graphics.

Clone DOS options arrive

The HY-DOS operating system for IBM PCs and compatibles should be available in Australia by the end of July. Presumably bypassing the first three releases, HY-DOS 4.0 made its Asian debut at Taiwan's recent Computex 88 computer show.

This closely followed the announcement of the DR DOS clone from Digital Research, and possibly highlights a trend by PC manufacturers towards licensing cheaper, more functional offerings than Microsoft's aging MS-DOS 3.3.

HY-DOS co-developer Wayne Haviland claims that his new system is fully compatible with Microsoft's MS-DOS 3.3, and "at least 95 per cent compatible" with the older MS-DOS 2.1.

The initial marketing thrust for HY-DOS will be in the Asian region, where Haviland claims Microsoft has neglected clone manufacturers. Speaking in Taipei, Mr Haviland said, "when we were in the early stages of development we came out here, and the clone manufacturers asked us to produce an alternative to MS-DOS because they had such a hard time dealing with Microsoft."

HY-DOS is expected to retail for about $89, but volume orders could be priced below the $50 mark. "We believe, unlike a lot of people, that the single-tasking, single-user system is not dead — it still has a huge percentage of the marketplace," Mr Haviland said.

HY-DOS is claimed to have faster keyboard response, disk access times and screen refresh, because it is "totally programmed in assembly language, with no C code at all," according to Mr Haviland. It features 76 internal commands and six external commands, and occupies a smaller area of RAM than MS-DOS. An extended batch processing language is included, along with several built-in utilities (calculator, notepad, ASCII chart, phone book, and calendar).

Meanwhile, DR DOS is also claimed to include superior features to MS-DOS, but will be marketed on ROM chips direct to OEM customers, rather than on disks. This DOS alternative is also claimed to be substantially cheaper than Microsoft's long-in-the-tooth MS-DOS.

END

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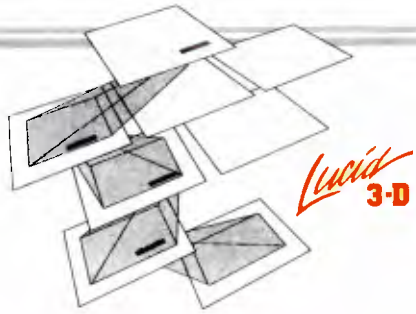

"The Best idea I've seen for a spreadsheet in years"
Jim Seymour, Columnist, PC Magazine, PC Week

Lucid is as simple as the pictures show. And you don't have to write formulas to do that. All you do is look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that way. Users say "*It is so intuitive that I really don't need a manual.*" That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said, "*If there ever was an interface idea so good it ought to be stolen and widely used, this is it.*"

Memory Resident

You can pop Lucid up instantly while working in your word processor or any other program. You can cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below. You can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note window that you instantly access with a single keystroke. You can write notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

Other Features

Lucid has over 100 innovations that cause users to say it is the best of all the spreadsheet offerings! Things like: **Speed** - background, minimal and visible recalc. **Macros** - learning macros, autoexecute macros, macros work between spreadsheets, user defined macro menus. **Mouseability** - total Mac-like mouse access, but easy keyboard control as well. **Color or Mono** - 17 user controlled color displays. **Audit** - six displays and printouts. **Windows** - multiple sheets on screen at same time. Multiple views of the same sheet. Pop-up windows of function formulas, range names, favorite labels, macro names, filenames, even a calculator. All let you select and insert right into your spreadsheet. All windows (even notes) resize and move where you want them. **Cut and Copy** - between spreadsheets, documents and between sessions. **Help** - press F1 anywhere, you get help specific to what you are doing.

Fig. 1. Let's get the detail on those ad costs, just move the widebar to that cell and press one key (grey +).

Fig. 2. Here we are instantly. Notice the lower left corner showing we are on level 2. Grey – takes you back. There is no limit to the levels you can go. Move right down to transaction level if you like.

Co-Winner of the 1987 PC Magazine Award for Technical Excellence
The other winner: Microsoft's Excel

Fig. 3. Of course, Lucid does multiple windows. Notice, you can simultaneously open windows in different directories, different drives, even down as many 3-D levels as you like. No one else can do that.

Masterwork

Lucid is more than a bag of features. It is a masterwork. The overall feel is tight and polished. In fact, Paul Somerson, executive editor of PC Magazine, used one word to describe it, "*Slick*"

PCSG has built an excellent reputation as a developmental laboratory. Now those who have worked with Lucid 3-D tell us "*you have done it again. This is software everyone should have.*"

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STATESIDE

Looking forward to the time when your PC does all your communicating for you, Tim Bajarin finds out what else the industry has on offer in the US.

VisiCalc: a hard act to follow

When VisiCalc was introduced in the early eighties, it started a revolution in personal computing applications. Until then, most personal computers were just hobbyist and techie machines.

But VisiCalc gave the user serious business applications with which a PC could greatly improve productivity. Since then, industry pundits have been constantly on the lookout for the next 'VisiCalc' or the next product that will add an important new dimension to the PC's role in business.

The closest thing we've had to the VisiCalc phenomenon so far has been desktop publishing. Although PageMaker and Ventura are the leading pieces of software here in the US, products like Boston Software's MacPublisher and Manhattan Graphics' Ready Set Go! beat PageMaker to the market. These products were influential in helping define the application area and played a major role in helping market development.

As an analyst, I have been shown many products that were heralded as the next 'VisiCalc' for the market. To date, none of them have had the type of impact VisiCalc or PageMaker has had. However, I am beginning to see glimmers of a new type of product that has all the potential of repeating the VisiCalc success story.

This time it's not just a single product, but rather a series of products that make up the concept of 'multimedia computing'. The most likely candidate for the important role of key software for this market could come from Macromind, a small Chicago-based company which sells a computer animation design package called VideoWorks.

This program was used at a recent conference to create a completely automated PC-based announcer similar to the Max Headroom character. Using a Mac II with 4Mbytes of memory, this VideoWorks-created character was used to announce each speaker and gave a full introduction, including biography.

It was like watching a television program, yet it was designed with a Mac II and a $US295 piece of software. Although the Mac II is a powerful graphics-based PC, it will pale in comparison to the next generation of graphics-based systems that will come out over the next 18 months.

Steve Jobs' NeXT machine will be very graphically oriented, and if a version of VideoWorks were on his NeXT PC, it could match real animated productions.

You can also expect to see powerful new graphics-based machines from Sun Microsystems, Sony, IBM, Apollo, DEC and Apple.

At first glance it would seem that multi-media computing could be relegated to just the presentation side of the market.

Considering the various new technologies that are emerging, like Hypertext and multi-dimensional databases on the software side, and high-resolution graphics-based PCs and interactive CDs on the hardware side, one can imagine the concept of linking PC animation to the delivery of this information.

As a result, the PC of the future will be more like TV in nature, not just sitting there in a flat, single-screen format.

But by using the frame-by-frame linking techniques VideoWorks employs, we could see the PC soon come to life. This concept, of course, would revolutionise the market.

With the refining of AI techniques, we would end up with true interactive computing. You would come to the office in the morning and log on to a database that has the weather, or stock prices, and so on, and when the screen was activated, it would deliver the information as would your TV. You would ask for the weather in Sydney and airport information, and an animated character would tell you that it is cloudy in Sydney, the airport is open, but due to heavy incoming traffic, flights are about an hour late.

Or ask for your daily stock quotes, and a customised macro of your specific interests appears as your personal stock reporter tells you how your portfolio is doing that day.

Interactive CDs would deliver archived information, while real-time services would provide the updates.

Although there are a lot of technologies that need to come together to make this all happen, the current presentation and animation packages will serve as the roots of this computer delivery revolution. By the early 1990s, your PC will not be just a slave — it will become your personal communicator, using real animated action to give you

Open season

One of the more important meetings in computer history took place in May. Twelve of the top computer companies met to endorse a new standard that will make it possible for almost all computers to eventually talk to one another easily.

In the world of telephone communication we already have that type of transparent capability. In 1885, the telecommunications industry set a standard. The same type of issues were resolved for fax transmission when Groups 2 and 3 were set up as worldwide standards.

Now, thanks to the work done by the International Standards Organisation, we will soon have a data communications standard known as Open Systems Interconnection (OSI).

IBM, HP, DEC and Unisys, along with eight other companies, announced that they would support these standards in all their current and future products. It does not change anything in the operating system, but it will determine how computers communicate with each other.

The largest OSI network today is one from Telenet, with over 300,000 subscribers worldwide. Since most government tenders will soon include OSI as part of their computer specifications, you can expect that OSI soon will become a worldwide standard.

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the information you need to be more productive.

And, because it makes the computer so easy to use, it could be the technology that brings the computer into every home and office.

Psion notes

I am fascinated with portable computing and think that it has a great future. But when I first saw the Psion Organiser, I was a bit confused.

The one-hand data entry concept is bizarre, but apparently you actually can master it if you work hard at it. It is quite useful, but seems to be more for daily scheduling or time management; it's not necessarily true portable computing.

Nevertheless, the Psion's an interesting idea, one that has had some success in Australia, but almost none in the US.

Now, a start-up company in the US has decided that a paperback-size computer is also a good idea and plans to market it soon. The key difference between the Psion product and this new unit is that it is a true IBM PC-compatible device.

Looking like a fat paperback, it has a 12-line by 32-character display, 512k memory, and a 1Mbyte active RAM card that simulates a disk drive.

The company, Paravan, of Melbourne, Florida, has made 180 units so far. Since it is such a small run, Paravan is charging $US3995 for this handheld midget computer. The company predicts that as production increases, the price will come down considerably.

The first group Paravan intends to target with this computer is the delivery and sales industries.

The company, at some stage, will add more versatile communication features, so that it even could be an E-mail retrieval system.

Don't underestimate the potential of a paperback-sized PC compatible. With the right components, it could become the fabled notebook computer many people are looking for.

Printers hit the high-resolution colour bar

One of the areas holding back the development of the desktop presentation market is the lack of colour hard copy in an affordable price range.

Colour lasers are on the horizon, but those prices will start at about $US40,000. Colour thermal transfer is an adequate process, but these printers start at above $US10,000 and PostScript thermal devices are about $US20,000. Although colour inkjet could be a viable alternative, the 120 by 120 resolution is too low to use in serious graphics presentations.

The technology that could make the biggest impact on this application is thermal wax printers. This process gives a true 300 dpi output and supports over 4000 colours. Besides Mitsubishi, which makes a print engine found in various devices, a leading supplier of this technology is Tektronix of Portland, Oregon.

Tektronix' printer outputs onto a special thermal printer or overhead transparencies. The colour is brilliant, and although it is not cheap, the $US8500 base unit is manageable.

The true impact of this type of product on the market will come when it can be produced to sell in the $US5000 to $US7000 region, including drivers. Tektronix just has delivered its Mac drivers and will have its OS2/Presentation Manager driver out in the next few months. The drivers are priced at an additional $US500.

But just as the high-quality PostScript lasers fuelled the initial growth of the desktop publishing market, these colour output devices could be the catalyst that finally

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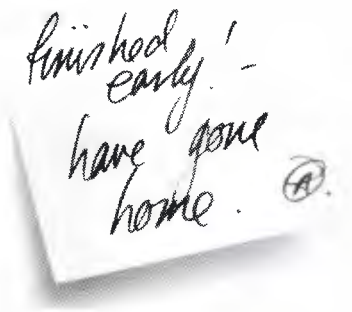

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makes desktop presentations take off.

If you prescribe to the school of thought that the graphics computers of today will be the general PC of tomorrow, then you can expect these users to demand high-resolution colour output as these machines become more popular.

PC on a PC

While recently in Hawaii on business, I ran across my first electronic postcard.

A local company, MagiMation, put together an IBM PC disk of information on the islands and included five animated scenes, complete with the sounds of Hawaii and in full colour.

It starts out with waves breaking against the shore on Waikiki beach. Then we see a guy 'hanging 10' as he surfs the waves at Sunset beach.

Next we see a volcano erupting, complete with fireworks and flowing lava. We also see an island beauty as she dances the hula. And, finally, we see a large 747 bidding us farewell as it heads off into the sunset.

It sells for $US3.95 in computer and book stores and is especially popular with the Japanese tourists.

Shell out

Ever since Microsoft introduced Windows, various software vendors have tried to develop a graphical-based DOS shell that could work on a standard PC.

In most cases, when using Microsoft's Windows, you need at least 640k of memory and it is recommended that for serious applications, you need a 20Mbyte hard disk as standard. A LIM specification Above Board memory upgrade would be optimal.

There have been various attempts at DOS shells, even one from Microsoft itself in MS-DOS Manager. But in most cases these have been text-based and are more file manager products than true windowing shells.

Since I am a Mac freak, I am always on the prowl for a product that would make a simple PC system Mac-like. Windows comes close, but it is power hungry.

But, a new product from Catalonia Software of Saratoga, California finally could fit the bill.

Billed by the company as the ultimate in graphic shells for MS-DOS system management, Overdos.System software overcomes DOS shortcomings by extending its capabilities: a visual directory tree, global file and search, moves and copies of selected files, the ability to change file attributes, and a temporary scratch area from where you can undelete errors.

The graphics interface uses windows, icons, a mouse interface, pull-down menus, dialogue boxes, and so on, and like the Mac, the system uses intuitive and visual presentations to walk users through.

This type of system is important to the market because of the high demand for low-cost PCs. Industry analysts believe that for the first time, the home business and small business market is taking off. In fact, in Silicon Valley you can buy a dual disk, 512k monochrome XT system for as little as $US399.

If you can give first-time users a windowing shell that makes program and file management intuitive and easy to use, then low-cost PCs really could come into their own. Ironically, the best PC for this new first-time user market is the Mac, but Apple continues to keep the Mac prices too high for this group.

With products like Digital Research's GEM on the Amstrad PC and Catalonia's OverDos.System in use on basic PCs, the standard PC could help fuel some exciting growth in this market.

END

THE ADVANTAGE

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Kaypro Corporation — electronics innovator since 1952 — has made a good thing even better. The KAYPRO 286i Model C now features a 40-MB hard drive and the 101-key AT-style keyboard. With the latest standard feature enhancements, the KAYPRO 286i is the smartest choice in advanced computer technology.

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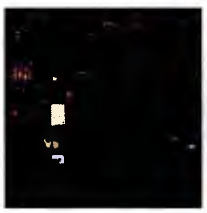

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DaynaFile

There is an ever increasing desire for information sharing between Macs and PCs. John Delacour looks at DaynaFile, a viable solution to file-sharing.

Three years ago, Dayna Communications aroused a mixture of mirth and anger in the Macintosh community by introducing MacCharlie, a device which fitted around the Mac and allowed it to emulate an IBM PC. While some Mac enthusiasts were amused by this hybrid's odd appearance, others were furious that such communication between the different operating systems was occuring. Times have changed and while MacCharlie wasn't a spectacular success, there is now a strong interest in communication between Macs and PCs.

Different manufacturers are offering a variety of solutions to the problem. The AST Mac86 and Mac286 coprocessor boards allow PC applications to be run on the Macintosh SE and Macintosh II respectively. These boards turn either Mac into an ersatz IBM PC and also allow file copying from PC to Mac and vice versa. MacLink Plus from DataViz is a combination of software for the Mac and PC with a cable to link the two machines. You connect the two computers, select the translation format (dBASE III to Excel, Word to WordPerfect, Multimate to MacWrite etc.) and the software handles the rest. Networking solutions such as TOPS allow simple file sharing between Macs and PCs and the DataViz software can be used under TOPS to take advantage of the full range of translators. But, coprocessors are costly, and not everyone with a Mac (even if on a network) has access to a PC. However, there is another solution — a drive for the Macintosh which will read PC disks. In fact, there are two solutions, one from Apple, the other a range of drives from Dayna Communications.

DaynaFile — the portable, easy to use solution to file sharing

The Apple PC 5.25in drive suffers badly in comparison to the DaynaFile design. It can only handle 5.25in 360k disks and requires a floppy disk controller card — this poses no problems for Mac II owners who have an abundance of slots but it occupies the only expansion slot in a Mac SE. Mac Plus owners, not having even a single slot, cannot use the Apple drive at all. An icon for the drive does not appear on the Macintosh desktop so the files much be accessed via AFE, Apple's file transfer utility.

The DaynaFile housing can be fitted with drives for either 360k (and 1.2Mbytes) 5.25in floppy disks or for the 720k (and 1.44Mbytes) 3.5in formats. You can have one or two drives in a DaynaFile and can freely mix and match the formats. This gives the DaynaFile user an enormous flexibility which is denied to the owner of the Apple PC 5.25in drive. Since the DaynaFile is a SCSI device it will work on any Mac with a SCSI port — the Plus, SE and II as well as upgraded 512's. It comes with its own power supply and has two SCSI ports so that it can be daisy chained to a hard disk or any other SCSI

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device. A switch on the back allows the user to alter the SCSI address number to prevent conflicts with other devices. To set up the DaynaFile, just plug in the cables and copy the Device Driver to your System Folder. Then restart your computer, flipping the drive on and off as well.

When everything stops whirring you'll notice a new icon on the desktop: a 5.25in 'fat' disk. Clicking on the disk opens a window that reveals the files. From then on, it's just like using a Mac. MS-DOS files are represented as documents and subdirectories appear as normal Macintosh folders. Copying MS-DOS files to a Macintosh disk or vice versa is as simple as dragging the document file into your hard disk window. But to use the DOS data, it will have to be in a form which can be understood by your Mac application.

Some PC data files can be read directly by 'clever' applications such as Microsoft Word, PageMaker and Excel. In other cases, it may be necessary to use a common format such as ASCII text. The problem with ASCII, however, is that all your formatting (margins, tabs, bold text, etc.) is lost. If your Mac application cannot read a particular DOS command, it leaves a box character instead. Some software developers are adding options to preserve formatting when the data is transported to another environment. Word 3.0, for example, uses a DCA (document content architecture) conversion utility to read the format of the IBM version of WordPerfect files.

If the PC files are not directly compatible with your Macintosh application, there are two alternatives. Apple File Exchange (AFE) comes with Macintosh System 5.0 and can handle text, binary and DCA files. Dayna offers a $199 solution in the form of translation software which is a watered-down version of DataViz's MacLink Plus, mentioned above. Dayna has licensed MacLink Plus to be used in its local mode only (that is, once the MS-DOS document has appeared on the Macintosh desktop). You cannot use the cable and Dayna's version of MacLink Plus to establish a direct link with an IBM PC.

The DaynaFile isn't without pitfalls, but its designers have thoroughly documented potential hazards. You will run into difficulties with MS-DOS disks that are too full or write-protected. In both cases the problem is with the Macintosh Finder: it needs room to create a desktop for the disk when it is first read by the DaynaFile. In the former case there is insufficient space on the disk, in the latter the Mac is unable to write the desktop file.

'. . . for sheer portability and ease of use, the DaynaFile is the best I've seen.'

When you're not accessing MS-DOS files on the DaynaFile, you can use it as a Macintosh external drive. As such it is a little pokey, but still usable. You can even use most of the normal desktop commands: Get Info, New Folder, Duplicate. It's almost easy to forget that you're working with data generated on an IBM machine. But there are times when interfacing with the DaynaFile isn't very clean. To eject a disk you have to first drag the icon into the rubbish, then pop the disk manually. If you don't, the Mac asks you to return the disk, and won't continue until you do so.

As outlined at the beginning of this review, there are certainly other solutions to file-sharing. But for sheer portability and ease of use, the DaynaFile is the best I've seen.

END

Retail Prices

Dayna File with single 360k 5.25in drive	$ 995
Dayna File with single 1.2Mbytes 5.25in drive	$1157
Dayna File with single 720k 3.5in drive	$1157
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IBM PS/2 Model 70

The questions raised by IBM's strange PS/2 numbering system have been answered with the launch of the fast, powerful desktop Model 70 and the re-vamped Model 50, the 50Z. But these apparent solutions to the performance limitations of the existing machines raise interesting issues of their own, as Peter Jackson discovered.

When IBM launched the PS/2 range just over a year ago, the numbering system left a lot of questions unanswered. Where was the Model 40, and why was there a gap between the tower-format Models 60 and 80? And on a less general note, why was the fast 80286-based Model 50 lumbered with the same slow hard disk type built into the 8088-based XT?

Answers to these questions now have emerged from behind IBM's traditional wall of silence over new product announcements. The gap has been filled, as expected, with an Australian-built desktop 80386 machine unsurprisingly called the PS/2 Model 70. And the Model 50 has had a mid-life re-vamp, with a new, fast hard disk and a faster memory architecture to put right the performance limitations of the original machine.

But these new machines, and particularly two of the four new models launched, raise interesting issues about the future of the PS/2 line, especially the old Model 50, the Model 60, and the Model 80. As their out-of-line type numbers indicate, the Model 50Z and the Model 70-A21 break the orderly sequence of performance increases from the Model 30 to the Model 80; put simply, the Model 50Z is faster than the standard Model 60, and the Model 70-A21 outstrips the top-end Model 80 and is easily IBM's fastest PS/2 yet.

For a move that at first seems designed to tidy up the holes in the PS/2 range, the new announcements seem to point either to upgrades or extinction for the old Models 50 and 60, and to a new, even faster Model 80. There will be yet more IBM PS/2s on the market before too long.

But for now, the Model 70-A21 deserves attention as the new pinnacle of PS/2 performance. And the 50Z deserves rather less attention (see the accompanying box on the following page) as a performance fix for the cheapest Micro Channel PS/2.

IBM PS/2 Model 70-A21

The Model 70-A21 is the fastest of the new model 70s, and the introduction of the 'A' in the type number — like the 'A' in 'AT' — stands for advanced. And in IBM terms, advanced is what the machine is. It is built around the 25MHz 80386 processor rather than the 16MHz and 20MHz chips used in the other two Model 70s and the existing Model 80s, and is therefore, somewhat oddly, the fastest PS/2 IBM makes.

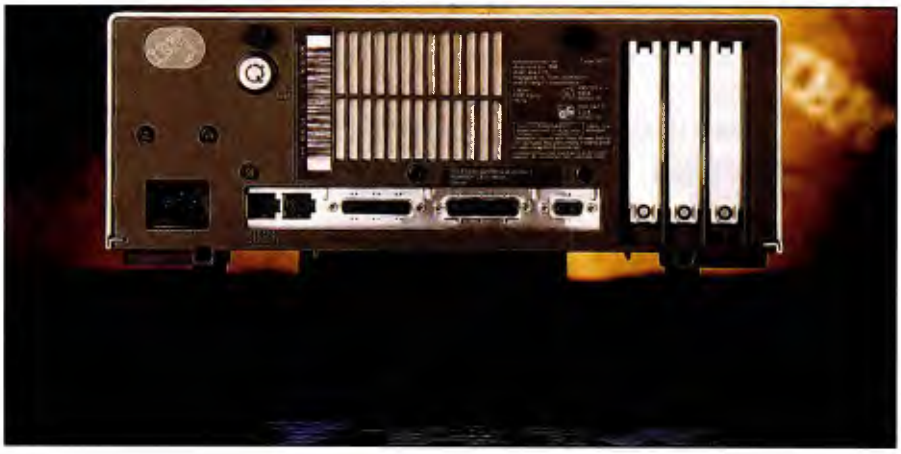
But there are other features that fit the new machine firmly into the PS/2 line and also put it on the leading edge of PC design. It is not just the IBM label on the front that makes the Model 70-A21 newsworthy.

Hardware

Externally, the machine looks like the other major PS/2 desktop system, the Model 50. The front panel has the familiar sloping bezel, sloping IBM label, single 3.5in floppy drive and power switch — although the switch has suddenly changed in colour from red to white, apparently for aesthetic reasons. The rear panel, too, has nothing unusual about it and holds the usual PS/2 complement of video, serial and parallel port D-type connectors and two small DIN-type sockets for the keyboard and the IBM PS/2 mouse.

The changes start to appear as soon as the case is opened in the usual snap-off PS/2 manner. In the centre of the system, supported by an aluminium frame that also holds the single 1.44Mbyte floppy drive, is a single 3.5in hard disk drive holding 120Mbytes. Taking out this drive, again without any tools being necessary, reveals the ESDI controller board integrated with the drive itself. This combination drive and controller is a wonderful piece of engineering put together by IBM Japan, and offers both a fast 27ms access time and an even faster data transfer rate of 10.4Mbits — well over a megabyte per second thanks to the ESDI interface and the 1:1 interleave factor. The small case size means that only one such drive can be fitted internally, however.

But the major new feature in the Model 70-A21 is the motherboard, which is not only a brand-new design but is also completely different from the boards in the 16MHz and 20MHz variants of the Model 70 family. The re-design was necessary because of the inclusion of the 82385 cache controller chip and its associated static RAM cache, which would have made the motherboard too big for the case if they had been built directly onto it. Instead, the 25MHz



Like the overall external appearance of the Model 70. the rear panel resembles that of a Model 50

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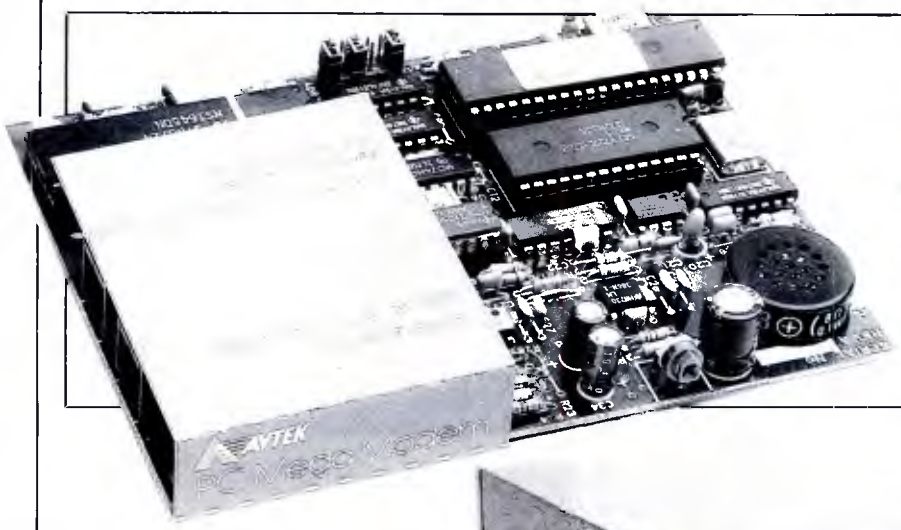

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Model 50Z

The 'Z' here stands for 'zero wait states', meaning that the RAM on the new Model 50 is faster than the one-wait-state RAM used in the original version. But it might have been more appropriate to call the machine the 50H for hard disk, because the major enhancement in the new system is a brand-new 3.5in 60Mbyte hard disk drive with an integrated ESDI controller like that used in the Model 70 hard disk units. The slow 85ms access time hard disk that came fitted as standard in the Model 50, and which could not be upgraded using IBM products, was the main area of criticism in the entire original PS/2 hardware line.

Now, the new drive offers 1:1 interleaving with a 27ms access time and an impressive data transfer rate of 1Mbyte per second.

Combining this drive with the use of up to 6Mbytes of SIMM-mounted 85ns RAM chips to give zero-wait-state operation at the usual 10MHz speeds of the Model 50's 80286 processor makes the Model 50 faster and more capacious than any low-end Model 60 model, and instantly prompts thoughts of a Model 60Z that would cut out the single memory wait state of the original 10MHz system. Otherwise, there seems little reason to buy a Model 60 apart from the greater total disk capacity available and the newly-fashionable floor-standing tower configuration.

The change from one wait state to zero produces the usual 25 per cent improvement in overall processing speed, making the Model 50Z run like a 12.7MHz one-wait-state machine. And the new-found speed of the hard disk sub-system adds to the impression that the 50Z is what the original Model 50 might and should have been. As the Benchmark results indicate, two simple architectural alterations — admittedly requiring a motherboard re-design to incorporate the SIMM slots — have produced a machine that is back among the leading 80286-based performers, at a price that is certainly competitive by IBM standards at $8990 for a 60Mbyte system including keyboard, but minus monitor, and MS-DOS. Strangely, IBM has not decided yet to drop the price of the original Model 50, which remains at $7490 — the same as the Model 50Z with a 30Mbyte hard disk.

A spokesperson for IBM indicated that the company felt the 'old' Model 50 would be discounted by dealers. Not a bad assumption, we think. Who'd buy one otherwise?

Benchtest

PS/2 Model 50Z

IntMath	**1.39secs**
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***APC* Index**	**4.33**

80386, 80387 maths coprocessor socket and the 82385 sub-system are included on a small piggy-back circuit board that sits on top of the main motherboard which fills the entire base of the case, and is connected to the motherboard via a narrow 120-pin edge connector.

The 82385, which first came to light in the Compaq DeskPro 386/20 and the ALR FlexCache 20386, is there for the usual purpose of speeding up access to the system's main RAM. The daughterboard in the Model 70-A21 includes 64k of 30ns static RAM chips built by Sony, caching the 2Mbytes or more of 80ns dynamic RAM on the main motherboard; and as with other systems, using the 82385 cache RAM is claimed to provide zero-wait-state memory access at the processor's full 25MHz clock speed in around 90 per cent of cases.

The system's main RAM is provided on up to four 2Mbytes single-in-line memory modules (SIMMs) that fit in dedicated RAM slots on the motherboard. The SIMMs each hold 2Mbytes of RAM, using conventional 1Mbit chips mounted back to back on a small circuit board rather than the odd 'sugar cube' style IBM-built chips used in the Model 80. On the review machine the chips were unlabelled, indicating IBM manufacture, but on other new PS/2 machines present at the launch, RAM chips were supplied off-the-shelf by Oki Electric of Japan.

With this SIMM arrangement, the Model 70-A21 can take a total of 8Mbytes of motherboard RAM and more can be added using the two 32-bit Micro Channel bus slots provided. There is only a total of three slots in all Model

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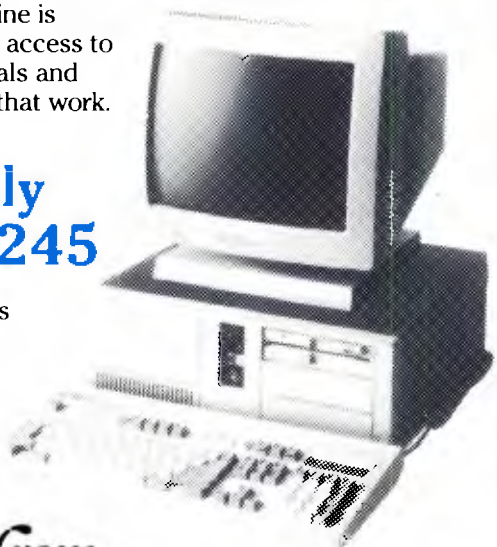

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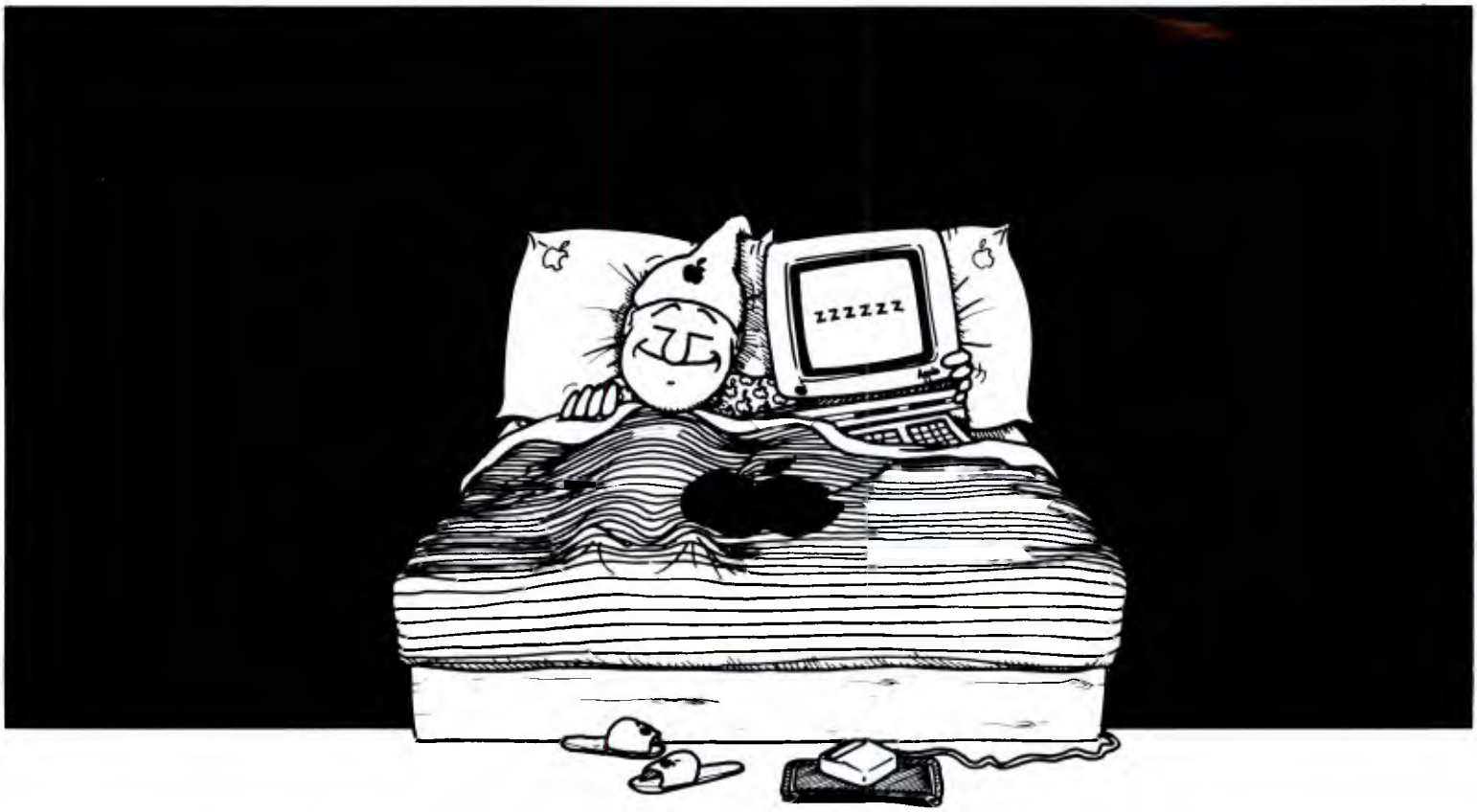

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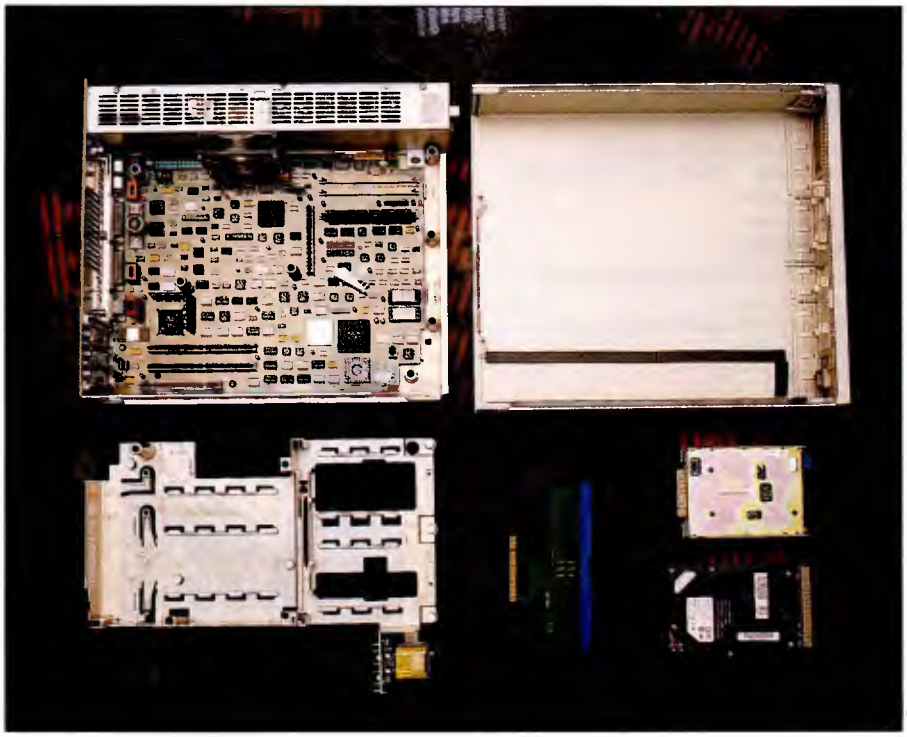

The Model 70-121 running at 20MHz shares with the 25MHz A21 a concentration of custom chips surface-mounted on the small-size motherboard. Up to 6Mbytes of RAM can be installed in SIMMs on the 70-121 motherboard, leaving three MCA slots free for other enhancements. The A21 uses a daughterboard mounted where the 80386 is on the above machine and this holds the 25MHz 80386, a 25MHz 80387 maths co-processor and a 25MHz 80385 cache controller. Scattered around the motherboard are a number of circuit boards mounted vertically which hold support circuits

70s, two 32-bit with matched-memory-cycle fast access features and one 16-bit with the video bus extension designed to take the 1024x768 8514/A video adaptor board.

Other features on the main circuit board range from the familiar to the unusual. The custom VGA controller chip and its associated Inmos digital-to-analogue converter and palette chip are in their usual places, but the 256k of video RAM is mounted on two odd extra circuit boards that stick out of the motherboard at an angle of 60 degrees, and actually overhang two sides of the VGA chip itself. And there are other small circuit boards mounted vertically on the motherboard, which look like simple thick-film resistor networks but whose real purpose is unknown since they are included to support big IBM custom chips or IBM programmable array logic (PAL) gate arrays.

The battery for the CMOS RAM configuration information is mounted on top of the speaker, meaning that dismantling the machine down to the motherboard inevitably involves the loss of the setup information and a fast search for the reference disk to resolve it. This is a shame — the machine is otherwise so easily serviced and maintained with no screws anywhere.

The Model 70-A21 joins the other two slower Model 70s and the new Model 50Z in making much greater use of custom circuitry and surface-mount techniques to cut down the overall chip count and cut down the size of the complete board to fit it into a small desktop case. On the review system every other chip seemed to be a PAL array labelled 'en-

Benchmarks

PS/2 Model 70-A21

Intmath	**0.44**
Realmath	**0.66**
Triglog	**2.87**
Textscrn	**15.04**
Grafscrn	**2.58**
Store	**11.37**
StoreHD	**1.67**
***APC* Index**	**9.59**

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gineering sample' — but obviously functional — or an IBM own-label custom circuit. There were a few jumper wires on the main board and the processor and cache controller daughterboard, but nothing too drastic for a machine at this stage of development which is not due to ship until the third quarter of the year.

IBM claims that the use of VLSI techniques and surface mounting cut the chip count of the Model 50Z so that 69 components in the Model 50 were reduced to five, and the circuit board size cut by 40 per cent thanks to this lower component count and the use of surface-mount techniques.

In use

The Model 70-A21 joins machines like the Intel SYP-302 at the top of the PC performance tree. Applications running under MS-DOS and OS/2 worked effectively and extremely fast, and the only compatibility problem came with using ill-behaved packages like SideKick Plus and the OS/2 MS-DOS box.

Running the latest test version of the Presentation Manager for OS/2 (see the accompanying box on this page) was impressive, particularly in fast switching between text-based OS/2 and MS-DOS applications and in window handling, but the speed of operation was such as to suggest that prospective users of the Presentation Manager and OS/2 should budget for the fastest machine they can afford.

There is little more to add; the 70-A21 is IBM's fastest PS/2, and feels like it. The official Benchmark figures confirm this feeling.

Prices

The Model 70-A21 with 2Mbytes of RAM and the standard 120Mbyte hard disk drive will cost $23,000 with keyboard, but without monitor or operating system.

END

Presentation Manager update

Although the graphics-based Presentation Manager environment for OS/2 seems to have been hanging over the industry for ever — and, to be fair, it has been impending for a year and a quarter with another six months to wait before launch — sightings have been rare outside the software development community.

But June's IBM launch offered an opportunity to check on the current state of the Presentation Manager, and a chance to look at how much it will diverge from the now-familiar interface of Windows 2.03 and Windows/386. Everyone now acknowledges that there will be differences between the Presentation Manager and Windows, and the latest Debug Version 4.25 of the Presentation Manager confirms that view in both overall feel and in the appearance of subtle user interface changes, largely included to suit OS/2 rather than MS-DOS.

The most obvious change is the way the Presentation Manager first presents itself to users. Like the character-based OS/2 Standard Edition 1.0, the initial display is what OS/2 Standard 1.0 calls a program selector and what Presentation Manager calls the Task Manager. In the graphics-based form this comprises a window on the screen offering a choice of full-screen OS/2 and MS-DOS 'compatibility box' text screens; an OS/2 command prompt in a Presentation Manager window; and any programs the user has selected to be included at start-up. Selecting an application in the Task Manager window by moving the highlight to it and hitting Enter, loads and runs the application, clearing the screen for direct OS/2 or MS-DOS access or putting the output in a Presentation Manager window.

The only access to MS-DOS and MS-DOS applications is via a full text screen, but the OS/2 command prompt is available through a clever piece of work that mimics a text screen in graphics mode inside a window. The size of the text in this window can be changed from a menu so that a full screen of text can be viewed in a smaller window, and the smooth scrolling of the text in graphics mode is a small miracle of programming.

Other developments to make use of OS/2 features take the Presentation Manager even further away from Windows. Presentation Manager applications running in windows can spawn 'child' windows of their own, and to distinguish child operations from parent operations the function key equivalents in the child window menus change to Ctrl key combinations rather than the usual Alt key combinations. For example, Ctrl-9 reduces a child window to an icon, and Ctrl-F10 zooms it to full-screen size. Naturally, with a mouse the operations stay the same in all windows.

An example of this kind of Presentation Manager application is the File Manager, which replaces the MS-DOS Executive application in Windows and adds many features for which the Windows equivalent has been crying out. For example, a child window can be called up showing a tree diagram of any disk in the system, and double-clicking the mouse on any directory in the tree displays its contents. And icons are used next to each directory entry to identify applications, documents, and other file types.

The way Presentation Manager handles icons, representing 'collapsed' but still active applications, is also new. Icons now can appear on top of screen windows, so that they can be made accessible when required without closing or resizing windows to make them visible. This is handy for checking which applications currently are active, since with OS/2 and enough RAM many copies of a single application can be open at the same time. Calling the icons to the top screen level, on top of any windows, allows a quick visual check to be made.

As with Windows 2.03 and Windows/386, Alt-Escape switches between active applications in rotation, while Ctrl-Escape brings up the Task Manager just as it brings up the Program Selector in OS/2 Standard Edition 1.0. But one useful feature of Windows — the use of Alt-Tab to move between applications and only making one active when the Alt key is released while its icon is selected — seems to be missing in the current Presentation Manager.

Overall, the Presentation Manager in its current form looks and feels more cluttered than Windows on a VGA-standard 640x480 screen, and still seems slow in many operations even on a 20MHz Model 70. There are obvious bugs in the development version too, including some weird graphics effects: for example, when switching between full-screen text displays and the graphics display, the occasional appearance of the previous screen contents inside icons, and the poor handling of icons that have been moved around the screen, so that the pop-up icon menus familiar from Windows get disconnected from their icons.

But given that there are still six months to launch, the Presentation Manager looks more complete and more robust than expected. And the user interface is close enough to Windows, and has enough additional features to make it an attractive front-end for OS/2 — but investing in a large, high-resolution screen like the 8514 may be advisable for optimum clarity.

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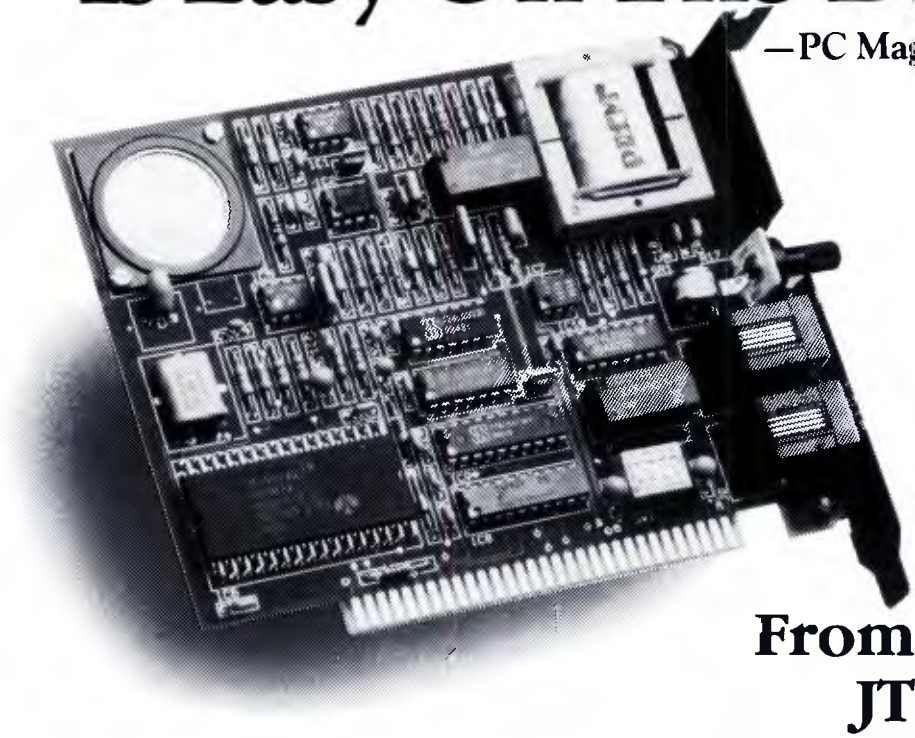

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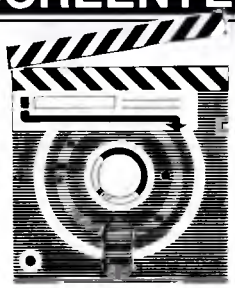

Borland's Sprint

Borland's Sprint word processor may score highly in the configurability stakes, but ultimately its scope for modification could be its downfall. Guy Kewney explains why, while Andy Redfern gives instructions on how to exploit the program's chameleon-like emulation qualities.

The single most impressive feature of Sprint, the word processor, has to be witnessed to be believed.

It is immune to system crashes; it is immune to power failure. You can actually turn the machine off, and not lose data.

Demonstrating it is fun. 'Give me dictation', you say to a word processor user. Rapidly and fluently, you type down what they say. After about four paragraphs, you stop, turn and say 'Watch!' — and you switch the machine off.

Then you switch it on, restart — and there is the dictation, as typed, complete. That is the moment to start explaining the program's other virtues, which are almost entirely whatever you want them to be. This is the chameleon word processor.

There is only one caveat: you almost certainly need to have a hard disk. It can be run on some of the higher format floppy disks, but due to the disk-intensive nature of the system, it runs very slowly. But once you've got the right hardware, you can do almost anything you want to do.

For example, you can have as many as 24 files open at once. You can even have the same file open in six separate windows, with each window looking at a different part of the text. And the nicest thing about it is that you don't have to learn how to use it.

Overview

In the age of the 'look and feel' lawsuit, Borland has summoned up its courage and announced a word processor that behaves like another word processor. Any other word processor at all. Not only like WordStar (which Borland has imitated before), not only like Word, but like *any* word processor you care to name.

'I don't think Sprint will be bug-free by the time Borland launches it, unless Phillipe Kahn delays the release beyond the 90 days he promised in April.'

However, Sprint is not WordStar, and it has many features of its own. For instance, it is not true WYSIWYG. Ask for double-spacing or running columns, and they don't appear on screen, only on printout. Move the cursor from column 55 down one line, and it will do its best to get as near to column 55 as possible, even if there are only two characters on the line. Next line, it will be back in column 55 again. Ask Sprint to print, and it goes into a Sprint print routine, not a Word routine or a WordStar routine.

Sprint is not the best word processor in the world. Your favourite word processor is — naturally — the best word processor in the world, whether it is WordStar, or Emacs, or WordPerfect, or DisplayWrite, or Word, or even GWBasic.

Some people might say your favourite is a pig because it needs a mouse or because it doesn't use function keys — but you know better. It does exactly what you expect it to do, and on the (rare) occasions when it does something startling, you know immediately what you did because it was your own silly fault and you know how to put it right.

However, despite its undoubted perfection, it would be nice if, in addition to all the wonderful things it does, you could also . . .

At this point, all your friends inform you, smugly, that the answer to this wistful thought is to use their own favourite.

Almost certainly, you do *not* want to use their word processor, which can't work in double columns, takes 27 key presses to produce italics, can't include graphics, or doesn't have a menu. You don't want a package which requires you

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*Fujitsu DX2300, 324cps, 2 fonts, auto feed	820
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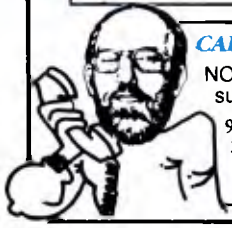

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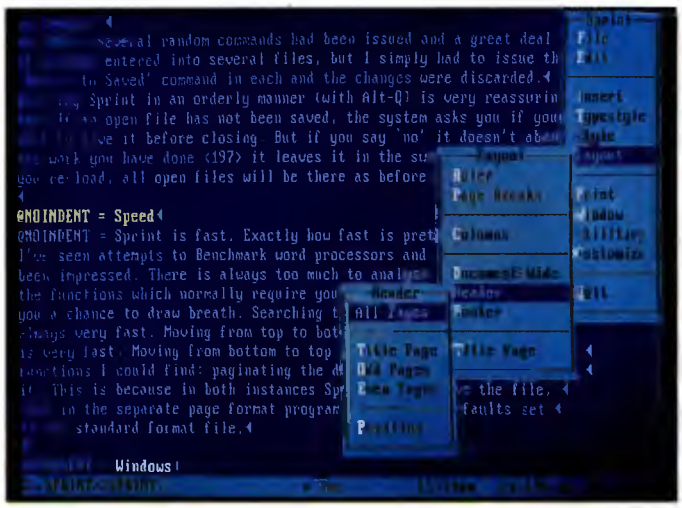
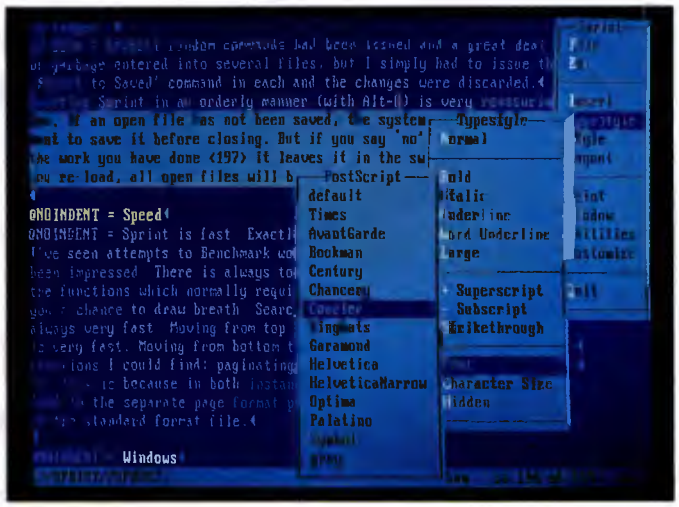


Each new menu pops up lower and further to the left of the screen. Commands to the print formatter regarding which predefined macros to use are in yellow text



To change the font or style of a region, the area is highlighted and then the actual style required can be chosen. The fonts are a list of those currently available in the default printer

to remember to press Ctrl-Alt Home-Home-Delete or whatever, just to see what files are on the disk. And who needs a word processor which produces files that look like Greek when you use the DOS TYPE command?

Sprint, at its best, may be the answer to all your problems. In its native form it is easy to use, with Borland's own system of menus and mnemonics.

But with very little effort it will perform in almost exactly the way your favourite word processor does. Ultimately, you can actually design your own private user interface so that it obeys commands known only to you. It will also be much more up to date, more powerful, faster and safer than your favourite. Borland even claims that it is a desktop publishing package.

Features

Safety

Safety is indeed its most impressive feature. It's almost impossible to lose data from a Sprint document. I've had the program for several months, as it developed. But even when it was in its earliest, most bug-ridden form, I used it as my preferred editor simply because it never, ever, threw away my work. Even when the machine totally crashed, my Sprint documents were always saved.

Carefully used, it can do even better than that. It can reject garbage accidentally typed by the office cat while you were away from your desk.

The technique it uses is that of the 'swap file' — a faithful copy of all the files in use, with extra keystrokes recorded as you make them.

When you stop typing, the program waits a second or so (you tell it how long) and then adds whatever you've just typed to the swap file. This has to be quick — one reason for the hard disk — and it can be a very big file, much bigger than a floppy disk could swallow.

If you were simultaneously editing six files, each of 100k, the swap file would begin at over 600k in size and grow with every keystroke.

When the user actually decides to save a file to disk, the keystrokes which have been added to that particular file are collected together; the file is updated; and those keystrokes are cleaned out of the swap file.

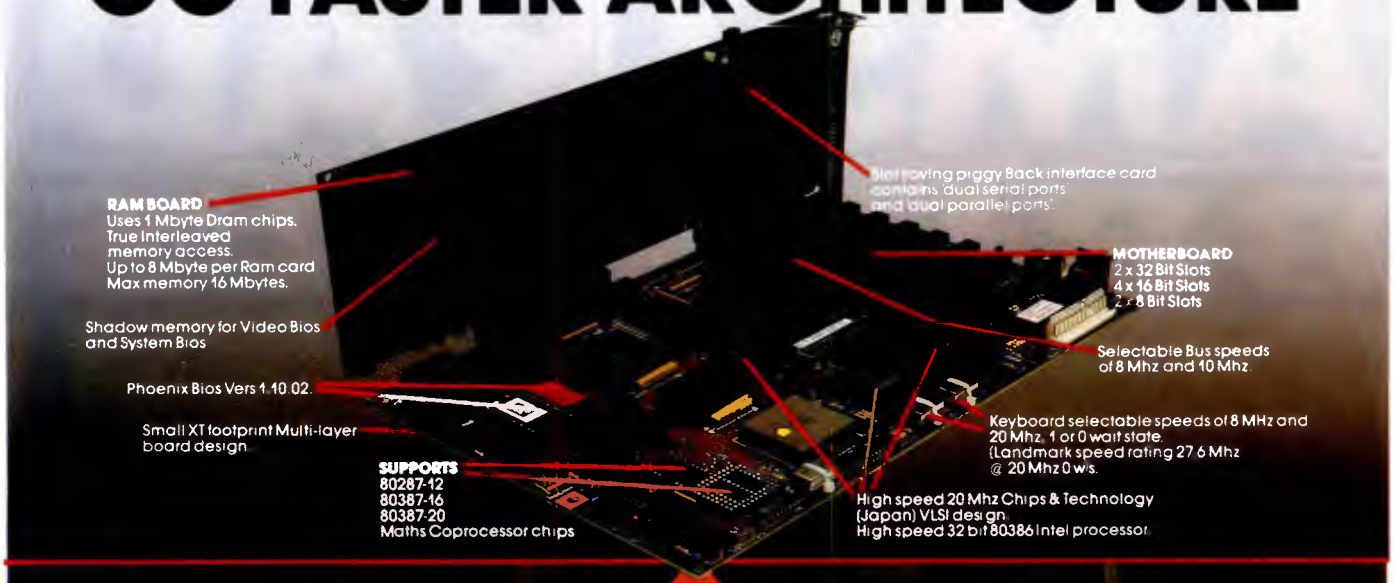
At that point, you really do feel safe. Once I left my desk to talk to a colleague. It was late, and while we rushed to complete plans for the next day, I became aware of the sound of plaintive beeping — recognisably Sprint because I set the beep on Sprint to a high-pitched, ear-piercing note.

Looking across the room, I saw the office cleaner at work on the keyboard, wiping the key-caps with a damp cloth. There was no need to even lose my temper.

Several random commands had been issued and a great deal of garbage entered into several files, but I simply had to issue the 'Revert to Saved' command in each and the changes were discarded.

Quitting Sprint in an orderly manner (with Alt-Q) is very reassuring, too. If an open file has not been saved, the system asks you if you want to save it before closing. But if you say 'no' it doesn't abandon the work you have

GO FASTER ARCHITECTURE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Phoenix Bios Vers 1.10.02.
Small XT footprint Multi-layer
board design
SUPPORTS
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80387-16
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and dual parallel ports.
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Keyboard selectable speeds of 8 MHz and
20 Mhz, 1 or 0 wait state.
(Landmark speed rating 27.6 Mhz
@ 20 Mhz 0 w's.
High speed 20 Mhz Chips & Technology
(Japan) VLSI design.
High speed 32 bit 80386 Intel processor.

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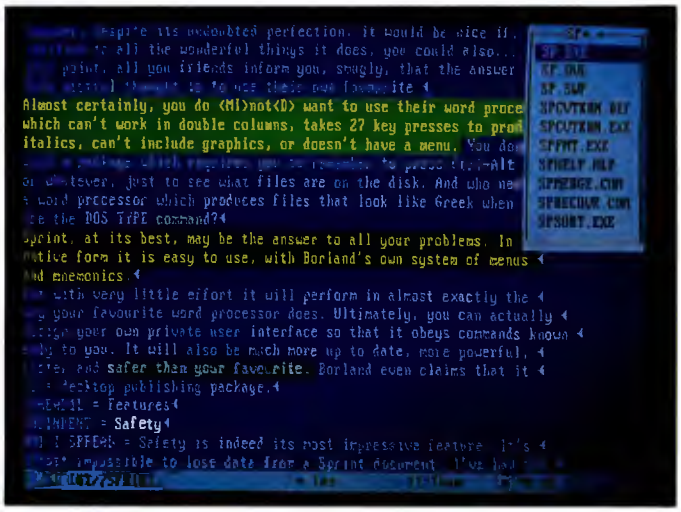
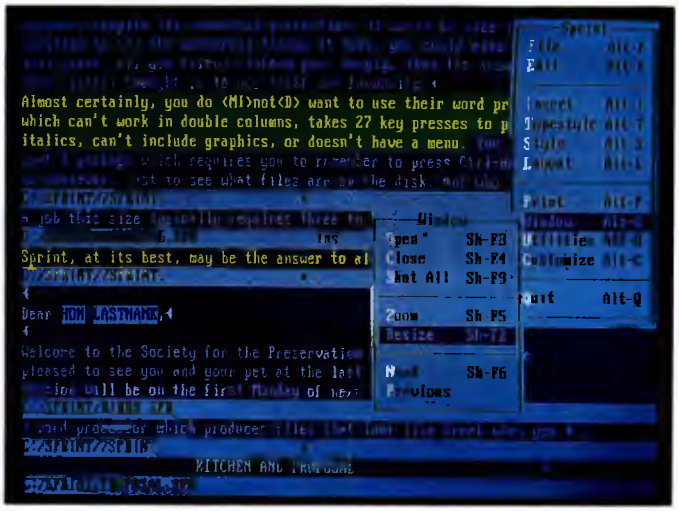

Almost certainly, you do <MI>not<D> want to use their word proce
which can't work in double columns, takes 27 key presses to prod
italics, can't include graphics, or doesn't have a menu. You do
Sprint, at its best, may be the answer to all your problems. In
native form it is easy to use, with Borland's own system of menus
and mnemonics.
with very little effort it will perform in almost exactly the
your favourite word processor does. Ultimately, you can actually
your own private user interface so that it obeys commands known
to you. It will also be much more up to date, more powerful,
and safer than your favourite. Borland even claims that it
desktop publishing package.
= Features
= Safety
= Safety is indeed its most impressive feature

When loading a file, Sprint will return a list of the files currently available in the selected directory. Selecting the file name in the menu will load it into the editor


Almost certainly, you do <MI>not<D> want to use their word pr
which can't work in double columns, takes 27 key presses to p
italics, can't include graphics, or doesn't have a menu.
Sprint, at its best, may be the answer to al
Window
Open" Sh-F3
Close Sh-F4
Shut All Sh-F9
Zoom Sh-F5
Resize
Sh-F6
Previous
Dear JON EASTMAN,
Welcome to the Society for the Preservation
pleased to see you and your pet at the last
will be on the first Monday of ne
KITCHEN AND

Windowing is supported and up to six windows on a single file can be opened. The working window is denoted by showing the current position in the document on the status line

done — it leaves it in the swap file and when you re-load, all open files will be there as before.

Speed

Sprint is fast. Exactly how fast is pretty hard to say. I've seen attempts to Benchmark word processors and so far have not been impressed. There is always too much to analyse. However, on all the functions which normally require you to wait, Sprint seldom gives you a chance to draw breath. Searching through a long document is always very fast. Moving from top to bottom of an enormous document is very fast. Moving from bottom to top is equally quick. The slowest functions I could find: paginating the document, and preview-printing it. This is because in both instances Sprint has to save the file, load in the separate page format program and use the defaults set in the standard format file.

Windows

Putting all 24 open files on the screen at the same time is only theoretically possible. You only get one line each, if you do. To cope with this, there is a 'zoom' key which opens the current window to cover the whole screen. Transferring from one window to the next is achieved by either jumping to each window in turn or picking a file from the files list, both commands being easily summoned with a single keystroke.

Menus

Borland's own contribution to the complex recipe which produced Sprint is a clever menu system. The menus look vaguely like Smalltalk (Apple Macintosh

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style) menus. However, they are designed to work with a keyboard, not a mouse. The mouse can be used but it is only interpreted as a series of keystroke replacements.

The menu works as follows. Suppose you want to print your document. Press Alt-P and the menu pops into existence in the top corner, with nine lines.

They are:

Go!	
Destination	PRINTER
Screen Preview	Ctrl-F8
Merge	
Paginate	Ctrl-F7
Remove Formatter Page Breaks	
Options	
Advanced Options	
Current Printer	(DEFAULT)

The rule is simple. Hit a key, and if it is the first letter in one of the menu options, you've selected that menu. If there are two entries with the same letter it will select the first, but hit it again and it will move on to the second. The beauty of this is only apparent when you change the menu.

Suppose, for example, that I fancied a menu which had PRINT! as the main option instead of GO!

I can do this. I alter the macro (see the accompanying box 'Programming your word processor') which changes the menu, and next time Alt-P comes up, typing P will select not 'paginate' but 'Print!'

Your macro can then decide whether you want to act instantly or wait for a carriage-return to act. In this case, if you acted instantly you could never hit P a second time to paginate.

Note that hitting either options or advanced options makes a second menu pop up with new choices but with the same rules. At this point, I am asked: Well, are the menu layouts any good? My answer is: How would I know?

In the few months during which I've been testing Sprint, Borland has shifted these menus around; it has changed the wording, changed the response, linked things together in different ways, until I hardly know exactly what will work and where an option can be found.

Of course, the big strength of the system is that it shows how easy it is to rearrange the user interface. Instinct tells me that the final default menu-tree will be OK, and that one or two points in it will irritate me profoundly. Who cares? — I'll change it if it really bothers me.

Alternate user interfaces

The default Sprint interface is a series of Alt-key driven menus, coupled with a WordStar-compatible interface. At any stage you like, you can switch. The Alt-C

(Customise) menu includes the option to change colours, to change the way the menus show 'short-cuts' (like the WordStar keystrokes) or the way it handles ASCII files. One option is to load a new user interface.

They were due to be added to, but included WordStar, WordPerfect, Word, SideKick, Emacs and Sprint itself. Here we find ourselves in areas I can't test. I can't test Word, because even with the original package and a manual, I've never been able to use Word. I can, and did, test WordPerfect, but only in a most trivial way.

The SideKick interface is essential, simply because without it, SideKick users who also have Sprint will go crazy. An example: to save a document to disk but continue editing it, in Sprint the command is Control-K followed by S; in SideKick the same command will be ignored. But Control-K followed by D (to save and continue in SideKick) will drop the file in Sprint — and you then have to reload it. Irritating, especially when the file is not on the current disk, and in a strange sub-directory. The WordStar interface isn't perfect, and can't be made to be so. For a start, WordStar works in a different way from Sprint. A Sprint paragraph always fits between its margins as you type it.

A WordStar paragraph reformats only when you tell it to. WordStar has a different text structure which distinguishes between ends of lines and ends of paragraphs by distorting the ASCII character. Sprint has a completely original structure, so a process which will find the end of the line in WordStar simply won't work in the Sprint version of WordStar.

From this, I deduce that veteran users of WordPerfect and Word will find themselves equally short of perfection. Well, that's life. At least it does work, to a large degree, and that's enough to get going.

The contrast is shown readily enough — all you have to do to prove how good the emulations are is to (accidentally) load the wrong user interface. On the Sprint user interface, you do this by typing Alt-C(ustomise), followed by U(ser interface), then L(oad) and then pick the right one from the list. I picked Word. Half an hour later, I abandoned my attempts to load a new user interface using the Word interface. As for getting any writing done . . .

File conversion

Having an editor that works like WordStar is fine, but you can't use it to edit WordStar files. You have to convert the file beforehand.

Sprint can convert files from several formats — from plain ASCII through DCA format, Wang format, WordPerfect, WordStar and even SideKick Outlook. Sometimes there are little mis-understandings, but they are easily fixable either by editing or by altering the conversion macro.

Cursor movement

This varies with the user interface. It defaults to the IBM standard arrow keys, plus WordStar direction mnemonics of Control-E and X for up and down, A and F for word-left and right, R and C for page up and down, and even the delete keys of control-T, Y and G.

There are other features. You can jump to any line — by number. You can set markers and jump to them. I'd quite

```
;    Additional Sprint Macros
;      Last modified 20/5/88
;      (c) Andy Redfern


tostart:            ;Macro to move cursor to start of document
        r toend     ;Set reverse direction and then goto start (end)


wordcount:
        0->int count                    ;need two count variables because
        0->int overflow_count           ;of integer overflow in long documents
        status "Please wait...."
        mark {                          ;marks the position and returns
                                        ;the cursor this point at end of macro
              tostart
              while (!isend) {                      ;repeat until end of document
                    (while inruler down)            ;don't word count in ruler
                    to (istoken || issent)          ;move to first word
                    past (istoken || issent)        ;move to end of word
                    past iswhite                    ;skip the white space
                    ++count                         ;increment counter
                    if (count = 10000) {            ;check to avoid integer overflow
                          0->count
                          ++overflow_count          ;increment overflow count
                    }
              }
        }
        message "\nThe document contains "
        if overflow_count {
              overflow_count message "%d"
        }
        count message "%d words."           ;print out the final result



newpara:                ;Move to next paragraph

        to ispara       ;Move to end of current paragraph
        to istoken      ;Move to start of next paragraph



blockcursor:            ;Example of DOS interrupt call
                        ;Change cursor to block style
                        ;rather than underline
                        ;Register ch = 0 cl=8
                        ;Execute int 10 function 1

        hardware "0 > CH 7 > CL 1 int 10"

;Assign macros to individual keys

^W: wordcount
^B: newpara

;To use program type in listing as shown and then type Alt-U, M, R
;and the macro will run assigning itself to the correct keys
```

Additional Sprint macros

AMSTRAD

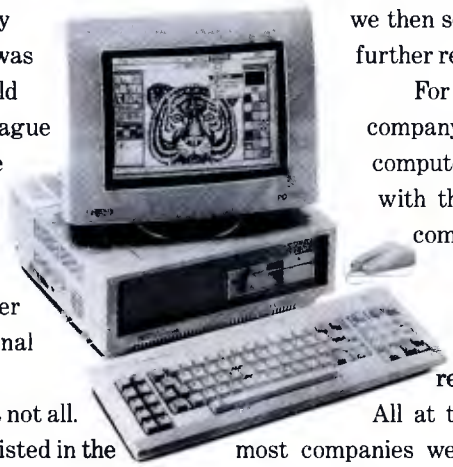
BRITAIN'S BIGGEST SELLING PERSONAL

Amstrad, the name on Britain's biggest-selling range of personal computers, is one of the most amazing success stories of the decade.

The company, first formed in 1968, was virtually unknown 10 years ago.

Today in Europe, the name is instantly recognisable and there would be few homes in Britain without an Amstrad product enhancing everyday life.

In the past two years the company has been voted Britain's "Company of the Year" in the annual "Business Magazine Survey"; named as the country's most profitable company by "Management Today"; was placed 17th in a world "Corporate Ranking" league by the leading Japanese financial publication, NIKKEI; and was awarded the Marketing Society's "Best Consumer Durable" for its personal computer range.



But even all that is not all. The company, which is listed in the Top 100 on the London Stock Exchange, also topped a 'performance efficiency' rating poll of the top 250 British companies which went on to describe dynamic UK Chairman, Alan Sugar, as the man "responsible for computerising the homes of Britain".

So just why is Amstrad so successful, and what are they doing here in Australia?

Well, basically, Amstrad is a mass marketer of consumer electronics.

Their expertise covers everything from the top-of-the-range personal computers to inexpensive hi-fi and video equipment.

Their incredible success is based on knowing exactly what products are right for the time, then making sure they are readily available at affordable prices.

To quote Alan Sugar "... everyone involved in product design is aware of the importance we place on developing high quality products that can be sold at very competitive prices... I believe this to be of prime and continuing importance... and once a product is in full production we then see how prices can be further reduced".

For example, when the company entered the home computer market it did so with the first computer to combine in one, 'ready-to-go' package a computer, monitor, keyboard, data recorder and software. All at the same price as most companies were selling just the computer.

When they entered the business computer sector they did so with a range of compatible machines which undercut the price of all their would-be competitors.

It was undisputed brand leader within three months.

Their very first wordprocessor, launched in 1985, won the Marketing Society Award in 1986.

One of the main reasons was its price, it sold for less than most electric typewriters.

The latest model, complete with daisy wheel printer to give 'letter perfect' quality, has totally opened up the business-user market for further expansion.

And the range of portable computers has also opened up a whole new market sector by putting these most remarkable machines within the reach of many more people selling, as they do, at up to four times less than the machines previously serving the market.

To quote Alan Sugar again, "The Amstrad philosophy is simple and straightforward.

"Our business is devoted to producing mass market products, be they designed for the domestic consumer or the business user.

"It is a simple objective but one which we have taken through to international success".

That philosophy is now about to be put into action in Australia.

There's no doubt it will meet with the same success here because it is a philosophy that is beneficial to everybody concerned.

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like other features, for instance the ability to jump to the end of a paragraph. Apparently if I want them, I can put them in.

Formatting

This is the area which was least impressive in the test version — not because the features weren't there but because they crawled with bugs. You don't want a list of things which didn't work when I played with an early version, so we'll assume they have been fixed.

However, there are several nice features. It is possible to have close control of how the final version will look, despite the difficulty of seeing things on the screen. For example, I have specified that no portion of text smaller than twelve lines may ever be split up at the end of a page.

This keeps nearly all my paragraphs in single blocks. But I can go further, and stitch two paragraphs together with a 'Nohinge' command. Or I can decide where a paragraph should be split with a 'Hinge' command. I can also leave space for pictures to be placed on to the page, create numbered lists, sort lists, have itemised lists, and generally produce very complex text.

I particularly liked the ability to put a ruler line into the document, anywhere, and to edit it in the normal way to change margins, tab points, and so on. My colleague, Andy Redfern, went bananas about this and wrote himself all sorts of complex macros designed to put in special headings, captions, footers and the like — and I'm glad to know it can be done.

Control of typefaces, styles, sizes, and so on, is discussed by Borland under the heading of desktop publishing. I'm not going into great detail about this, simply because the amount of fun you can have with these typographical tricks is more a function of your printer than of your word processor.

However, we discovered one little feature which is quite fun — the line-drawing feature. You switch this on, and draw all over the screen. The program draws the right IBM graphics character to make boxes, lines and arrows, and keeps it all in order. It's not art, but it works.

Again, all these clever features are more under your control than under Borland's. There is a file called STANDARD.FMT which controls formatting. You can edit it, change it, improve it and destroy it.

Printing

Sprint is a modern, full-feature word processor which understands modern problems like laser printers, PostScript engines, graphics files to be included, and so on. I'm just a word processor user and really not qualified to test all these features beyond noting that everything I tried to do worked okay. Some things which didn't will, I have no doubt, be fine in the final release version.

I particularly appreciate the ability to select paper by size, and the powerful options, when installing a new printer, to specify how much paper you have sticking up when it starts. However, I didn't like the system of printing itself. It is very like compiling a program — the print program loads, looks through the file, and produces an output string either to disk, to screen or to printer.

Which is all very well — if only it wouldn't come back like a typical compiler and complain of syntax errors! The '@' symbol, for instance, is a special character, and you have to remember to type two of them if you want one. One on its own will generate error reports or very strange effects.

Installation

You can load and run Sprint without installing it. The installation program sets defaults of user interface, printer, display, and so on, some of which can be selected from within the program or changed.

It's possible to set this program up to work in 55-line mode on a VGA screen, which has to be seen to be believed. And it's possible to ask for alternate screens and printers as well as your default choice. The final installation system is in production.

Problems

The program's biggest plus is its ability to be modified by the user. This is also its biggest hazard. As explained in the 'Programming your word processor' box, new macros have to be written in a genuine programming language that will be totally familiar to any C language expert. That's not me, nor 98 per cent of word processor users.

Programming your word processor

One of the more unusual features of Sprint is its chameleon-like ability to emulate any other word processor. This is achieved using the macro language which lies at the heart of the Sprint editor. At its simplest level the macro language allows the user to record keystrokes that can be replayed at a later date. At its most complex, it provides all the tools necessary to build a whole new user interface.

To remark that the macro language is reminiscent of C gives some indication of how much power is at the fingertips of the user. Not only can the menus, cursor or page layouts be manipulated, but even low-level DOS interrupts can be executed. Unfortunately, the power these macros have is their biggest weakness. Programming them is not simple. Programming a whole new interface can be a long and difficult task, but luckily Sprint allows three different levels of macro-making to simplify the process.

The first of these is keystroke recording. Most PC users will be familiar with the concept of this type of macro from using packages like Borland's Superkey. These packages allow the user to record keyboard keystrokes and then play them back. For example, in your favourite database package a series of keystrokes may be needed to perform a sort. So, you can record the keystrokes as a macro and then play them back whenever a sort is required. Sprint has the ability to do this and is useful when recalling long words or setting up the document layout. These macros are stored in a permanent glossary and can be assigned to individual keystrokes.

The second type of macro programming involves making a text file containing the macro. This file is given the extension .SPM. The 'Example macro listing' on the previous page is a list of macros from such a file.

Each macro is defined by a label followed by a colon. All the macro instructions which then follow are assigned to that label and the macro is terminated by either an end of file or a new macro label being encountered. The simplest way to compile the file is to edit it in Sprint and then select Run from the macro menu. This will then save the file before actually compiling it. My biggest dislike is that, at present, there seems to be no way of exiting the compile process once it has begun. Any errors are reported as they occur and require the user to acknowledge before the compile continues, but the user cannot abort the process.

When the files have been compiled they are written to the SP.OVL file. This is the overlay file which contains all the macros that describe the current user interface. Even though the macros have been compiled into this file, they are not accessible until they are assigned to either a keystroke or as a

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Vert. Scan Hz	45-75	50-60	50-60	50-100
Video Band	32	30	30	30
MONO Version	YES	NO	NO	NO
CGA Card	YES	YES	YES	YES
Hercules Card	YES	NO	YES	YES
EGA Card	YES	YES	YES	YES
PGA Card	YES	YES	YES	YES
800 x 600 Card	YES	NO	NO	NO
VGA (IBM PS/2)	YES	NO	NO	NO
Apple MacII, SE	YES	NO	NO	NO
132cx 45r Text	YES	NO	NO	NO
3270 (2,3,4,5)	YES	NO	NO	YES
PAL/NTSC Video	YES	NO	NO	YES

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part of a menu tree. The simplest way is to assign the macro to a key using the macro enter function.

For example, I assigned the word-counting macro to <Ctrl><W> and especially for Guy Kewney's benefit, assigned the next-paragraph macro to the <Ctrl><B> key combination. In doing this, any other macro that is called by that keystroke is no longer available. This can be very confusing. Knowing exactly which key did what after two days of experimentation became tricky. The Borland macro team realised the problem and included a reference card macro. This will find what all the keys are currently assigned to and print out the results as a reference card. This feature is a necessity in such a configurable environment.

This method of adding macros into the current user interface is not a difficult task and, with the aid of the step-by-step explanation in the *Reference Manual*, even a novice programmer could be up and running within a couple of days. Even so, I found it very useful always to keep a copy of the main system files in a backup directory so that if I crashed the system completely, it could be easily recovered.

The third type of macro usage is to develop a whole new user interface. Although Borland has been shouting about this for quite a while, it is very poorly documented. In fact, the only direct reference to writing a new user interface is a challenge to the macro programmer to write one. And, judging by my own experience, a challenge it certainly is, especially with the minimal documentation provided. Borland's advice 'to use the time-honoured method of learning from other people's code' is good as far as it goes, but doesn't really help anyone starting from scratch.

The user interface, like C, is controlled by a macro called 'main'. This macro executes every time a key is pressed, so it is not advisable to make it too complicated. When the program begins an 'init:' macro is run, allowing the default variables to be set. All complete user interfaces need to have these two routines, but after that it is up to the user to define the menu and macro structure, and the keystroke assignments. The process of keystroke assignment can be automated to save having to assign every key using the macro assignment command. For example, we could assign the word-counting macro to the <Ctrl><W> key using the command ^W: WordCount. In fact, it is advisable to define any keystrokes not used as 'null' so that the editor knows to ignore them.

I enjoyed having the power to make my own macros and even to write my own user interfaces, but I am a programmer at heart. I am not an average word processor user. For people to be encouraged to write their own macros, Borland needs to consider some form of macro generation program.

END

Usually I've found Borland to be sympathetic to ideas and suggestions as to how the program should be rewritten, but they have sometimes taken the attitude: 'Well, that's how it is, and if you don't like it, change it. I'm sure there is a way of looking for a carriage return — but I can't find how. I could write a macro. I want to jump to end of paragraph. I could write a macro. And so on.

Really, that's an option for only a small proportion of users — maybe a high proportion of *APC* readers, but office secretaries, sales managers and teachers out-number our readership by many, many times.

Inside large companies — the target market — there will be people with the necessary skills to tailor the package to the company's own requirements. Otherwise you may have to learn to write C-style language instructions. Or else, put up with one or two things as they stand.

Wish list

I'd like an outliner, or at least a folding editor. Borland doesn't understand this. I'd like an automatic macro generator — like a fourth generation language compiler. I really *would* like windows that split the screen vertically. Much of my text is in narrow columns, and having two files side by side would be valuable. Most of all, I'd like to use my favourite pop-up program, which Borland has disabled.

But having said that, I have to say that this is my favourite word processor, and I haven't used WordStar since getting it except for a difficult file conversion job.

Documentation

The fact that this review was written on the basis of testing a beta version means that the documentation supplied was little better than rudimentary — and quite often misleading. Generally, Borland demands high standards from its manual authors, so I'll say I'm optimistic for the future and leave it at that.

Conclusion

I don't think Sprint will be bug-free by the time Borland launches it, unless Phillipe Kahn delays the release beyond the 90 days he promised in April.

There's nothing surprising in that either way: software has been delivered late or full of bugs ever since programs were first written — often both. What may be more unusual is the recommendation that follows: buy it anyway.

Why not? It works, and it is possible to work your way around any of the problems of early versions. And it is safe — safer than any other word processor you have ever used with the possible exception of its ancestor, Final Word.

END

Sprint should be released later this month (July) and will sell for approximately $350. For more information, contact Tech Pacific, 119 Ferrars St, South Melbourne 3205. Tel: (03) 690 9055.

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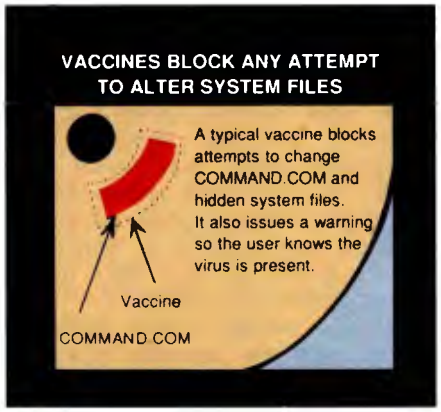
Viruses-it's time to talk!

Jim Seymour and Jonathan Matzkin confront the growing threat of harmful computer software viruses.

Now you see it: now you don't. Or maybe you never really saw it at all.

That will-o'-the-wisp nature of computer viruses, and the incredible difficulty of proving their role in the loss or destruction of data, have made tracking them down, defeating them, and protecting against them incredibly difficult.

It is so easy to lose data in a computer system — any computer, from a PC to a Cray supercomputer. Often what was almost certainly operator error, or magnetic media wear, or power-line fluctuations, or any of a hundred other quite normal if no less frustrating events, is misidentified as the work of computer viruses.


VACCINES BLOCK ANY ATTEMPT TO ALTER SYSTEM FILES
A typical vaccine blocks attempts to change COMMAND.COM and hidden system files. It also issues a warning so the user knows the virus is present.
Vaccine
COMMAND.COM

But that is not the whole story.

The sceptics insist that the computer virus alarms are overstated. That scepticism has been fed by wild and unconfirmed reports, impossible to track down, of such infections as one that supposedly brought the Unix systems of a telecommunications giant to their knees, or a 'PLO' virus aimed at shutting down the Israeli defence computer system.

It isn't surprising that these stories should have persuaded the sceptics that viruses are cruel jokes, this year's brand

Computer viruses

The problem with the computer virus issue is that, understandably, people are not prepared to risk destroying their computer system to test programs for a lurking virus.

The current debate emerging in Australia concerns two types of destructive software — namely, trojans and viruses. Trojans purposefully damage a user's system upon their invocation and then normally self-destruct along with the damaged files. A virus reportedly can lie dormant in a system for some time before activating and can spread from file to file before it acts as a trojan.

Both forms of software apparently enter a computer system by someone creating or altering a program to contain the self replicating computer instructions. A virus or trojan will more likely lurk in operating code that is difficult to access.

Bulletin Boards across Australia are progressively publishing reports of virus and trojan outbreaks. There are enough reports of systems being damaged by the so-called viruses for the prudent computer operator to be informed of suspected software titles. The following is a current list of identified trojan or virus programs.

ALTCTRL.ARC This program reputedly trashes boot records.

ARC513.EXE This hacked version of the SEA's ARC.EXE appears normal. However, it writes over track 0 of the hard disk upon usage, destroying the disk's boot sector.

BACKALLY.COM This sophisticated program will axe the computer's File Allocation Table (FAT) after a couple of months usage. BACKALLY may only work on floppy disks, but that sounds unlikely. Debug has shown that BACKALLY formats a track at one point as well as reading in the amount of free-space on the disk. It may only wipe out full disks, like NOTROJ.

BACKTALK This once beneficial utility will write/destroy sectors on the hard disk drive. Use this with caution if acquired, because it's possible you have a bad copy.

CDIR.COM This program supposedly gives a colour directory of files on disk, but, in fact, it scrambles the disk's FAT table.

COMMAND.COM A virus which embeds itself in COMMAND.COM. Once there, it will copy itself onto four floppies before scrambling the FAT and initiating a format.

continued

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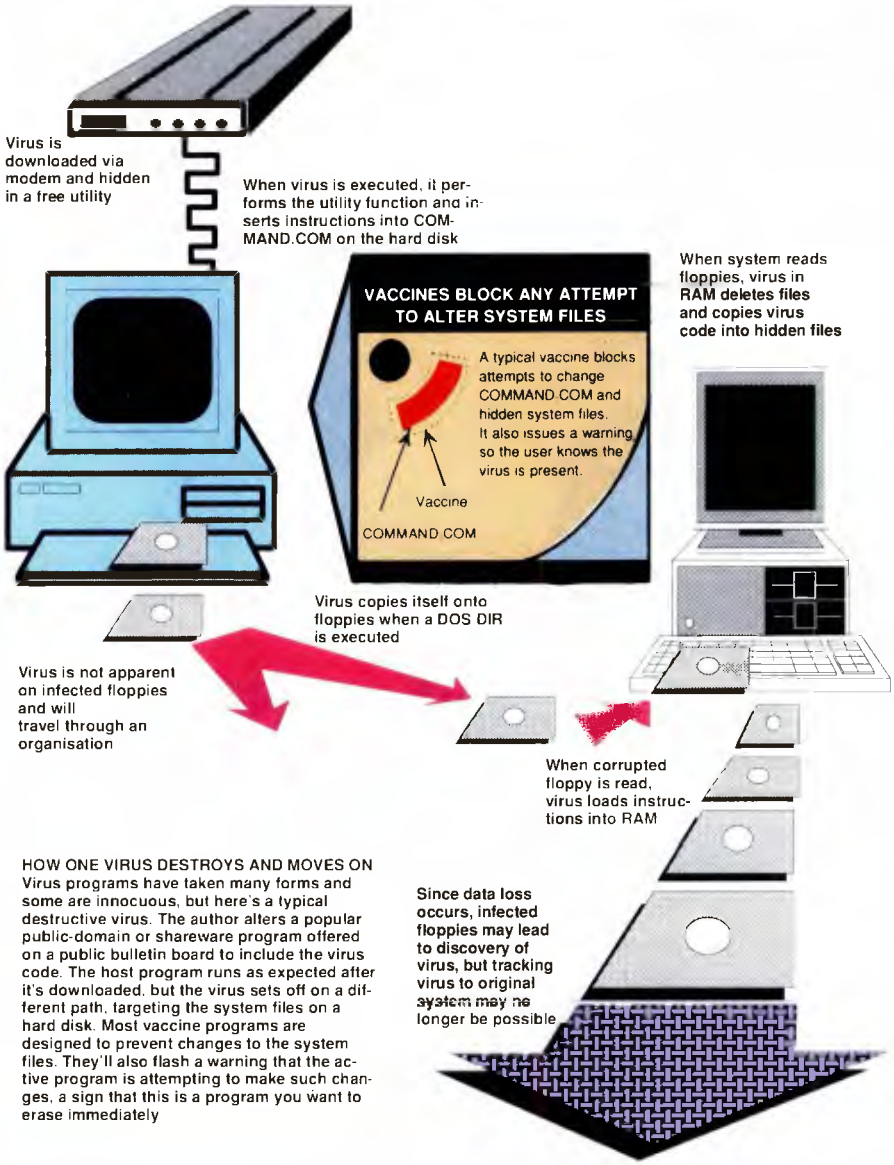
Virus is downloaded via modem and hidden in a free utility
When virus is executed, it performs the utility function and inserts instructions into COMMAND.COM on the hard disk
VACCINES BLOCK ANY ATTEMPT TO ALTER SYSTEM FILES
A typical vaccine blocks attempts to change COMMAND.COM and hidden system files. It also issues a warning so the user knows the virus is present.
Vaccine
COMMAND.COM
When system reads floppies, virus in RAM deletes files and copies virus code into hidden files
Virus copies itself onto floppies when a DOS DIR is executed
Virus is not apparent on infected floppies and will travel through an organisation
When corrupted floppy is read, virus loads instructions into RAM
Since data loss occurs, infected floppies may lead to discovery of virus, but tracking virus to original system may no longer be possible

HOW ONE VIRUS DESTROYS AND MOVES ON

Virus programs have taken many forms and some are innocuous, but here's a typical destructive virus. The author alters a popular public-domain or shareware program offered on a public bulletin board to include the virus code. The host program runs as expected after it's downloaded, but the virus sets off on a different path, targeting the system files on a hard disk. Most vaccine programs are designed to prevent changes to the system files. They'll also flash a warning that the active program is attempting to make such changes, a sign that this is a program you want to erase immediately

Mum and Dad into their offices." The university has developed its own 'vaccine', a program that checks the COMMAND.COM file at boot-up and, if it finds the virus, writes over that part of the disk. The university has also begun using 'notchless' floppy disks and encouraging the use of write-protect tabs as protective measures.

"If you don't take precautions, you're just asking for a disaster to happen," VanWyk says. And, chillingly, "given how easy it is to write even a simple computer virus I think we have seen only the tip of the iceberg . . ."

The virus that infected disks was typical of simple viral code. About 300 bytes of assembler, it looked for the COMMAND.COM file present in DOS and attached itself to it. It then was spread by duplication of that disk, or insertion of that disk into a PC with a bootable hard disk. Later, the virus began its dirty work, erasing the disk.

Another university has been hit by a virus, BRAIN. Joe Simpson, assistant manager of academic computing services, had to deal simultaneously with BRAIN on the university's PCs and SCORES, yet another strain, on its Macintoshes.

"Once the epidemic was recognised, panic set in here," Simpson says. "A lot of people lost data to these viruses. We still don't feel we have a complete understanding of what happened."

If you boot a PC from a floppy disk containing BRAIN, the virus copies itself onto any disk for which you subsequently ask DOS to show a DIRectory. The strain that infected hundreds of disks at this university was relatively benign.

SCORES, the most widely distributed

they are and how to tell whether their system has been infected.

- **Backup and recovery procedures** Develop easy procedures for routine backup of important computer files. Make backup hardware (ie, tape units) readily available to all users. Users connected to LANs should use automatic backup features. Suggest file organisation structures that facilitate backup and recovery of disks that have been ruined by computer viruses.
- **Isolate software libraries** On larger computer systems, consolidate libraries into 'Real Only' directories. In general, system or shared software should have limited update and write attribute privileges.
- **Implement software library management procedures** Enforce program testing, version control, and quality assurance checking for all software libraries. Use software library management tools to control and audit programs. Assign responsibility for testing public domain software and providing 'approved' copies of that kind of software. Know sources of software, inspect distribution media and documentation for tapering, and develop a 'master copy' system.
- **Develop a virus alter procedure** Circulate information about potential or known viruses. Procedures for containment and eradication should be thought out beforehand. These procedures usually require shutting the system down, reformatting disk or tape storage media and rebuilding software libraries with known uninfected copies.

Not withstanding the importance of the above measures, experts are working hard to create new vaccines to combat malicious software. A current program to protect against viruses released to BBS's is called CHECKUP.

While most programs of this nature do a repetitive check sum count on critical programs, CHECKUP goes one step further. It breaks a program into random length blocks and calculates a check sum on each of those blocks before adding them together to derive a total. The total is then compared with the results of previous check sums of that program.

It is certainly hoped by everyone in the computer industry that viruses and trojans are not widespread, but when you know you've got it, it's too late for wishful thinking. At this point in time, the best protection is prevention.

Katherine Davis

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Anti-virus programs

Flushot Plus

Anti-virus programs are aggravating by nature because they can prevent you from doing perfectly normal tasks like formatting a floppy disk. Flushot Plus, from Software Concepts Design, provides flexibility to offset the annoyance.

You can tell it to allow low-level disk access *only* until the end of the next program. That will let you run FORMAT without interruption, for example. You also can turn its protection on and off easily.

Flushot Plus is shareware, but it has more features than many commercial programs. These include approved TSR list, write-protection, read-protection, signature check, run-time signature check, disk access lockout, FAT copy, and CMOS copy.

The FLUSHOT.DAT data table lists the types of files you want to write-protect or read-protect, along with any exceptions to the type. For example, you could write-protect all .COM files except those in the 'DEVELOP' subdirectory. The table also lists your approved TSRs and any files you want signature-checked. You're advised to hide this data file under a different name to avoid 'smart viruses' targetted to damage it.

Mace Vaccine

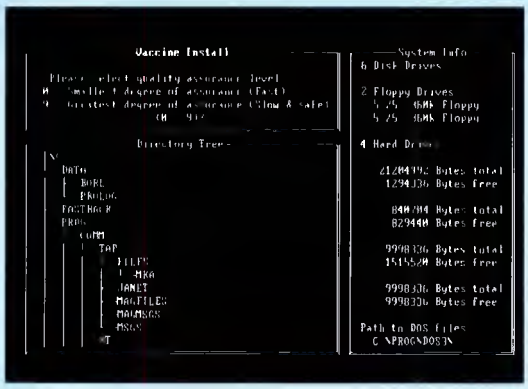
Mace Vaccine, from Paul Mace Software, offers two levels of protection. At level 1, it gives write-protection to system files, the boot sector, and the partition table. It also guards against common tricks that disable the root directory. Protection level 2 adds disk access lockout. Mace Vaccine is best used with the Mace Utilities, which include a FAT copy and restore program.

The program is simple and the documentation just one page, but you *do* get a degree of protection.

Vaccine, Version 2.0

WorldWide Data's 'Vaccine' consists of three programs:

ANTIDOTE — Known virus check.



CHECKUP — Signature check.

VACCINE — Approved TSR list and disk access lockout.

ANTIDOTE is fast and clean. In just a few minutes it scanned over 300 executable files on my system and flagged ten simulated infected programs. WorldWide Data will provide 'booster shots' — updates to ANTIDOTE that handle any newly discovered viruses. CHECKUP takes more time checking its signature file. Both programs check only .COM and .EXE files, so viruses that target overlays or other executable files will get past this version.

The WorldWide Data 'Vaccine' programs are unobtrusive. They only scan for known viruses or check your signature file when you ask. The manual is short, but the programs are simple enough to operate. Used systematically, they should protect against any virus that attacks .COM or .EXE files. If a virus or Trojan Horse does invade your system, they at least will prevent it from trashing your hard disk.

At a glance

Flushot Plus, Version 1.2,
Software Concepts Design
Ross M. Greenberg
594 Third Avenue
New York, NY 10016
(212) 889 6438 (electronic BBS)
Requires: 10k RAM (RAM-resident size); IBM PC, XT, AT, or PS/2, or 100 per cent compatible; DOS 2.0 or later. Not copy protected.

NB: We had some difficulty getting through to this bulletin board during business hours in the US and therefore suggest contact be attempted during daylight hours in Australia. The Shareware registration fee is $US10.

Mace Vaccine
Software Wholesalers
7-8 West Street
North Sydney 2060
Tel: (02) 957 6686
Requires: 4k RAM (RAM-resident size); hard disk; IBM PC, XT, AT, or PS/2, or 100 per cent compatible; DOS 2.1 to 3.31. Not copy protected.

Vaccine, Version 2.0
Creem Corp
105 Collins Street
West Perth, 6005
Tel: (09) 481 5277
Requires: 4k RAM (RAM-resident size); IBM PC, XT, AT, or PS/2, or 100 per cent compatible; DOS 2.0 or later. Not copy protected.

Macintosh virus, is much more pernicious. It looks for specific programming 'signatures'. It has appeared at many academic and business computing centres.

At EDS, a computer firm, two dozen Macs were quickly infected with SCORES. The programs it was affecting were first developed at EDS; the company won't talk about those programs, saying only that they were 'proprietary trade-secret programs'. With a wealth of programming talent to call on, the company was able to stamp out the virus in a matter of days.

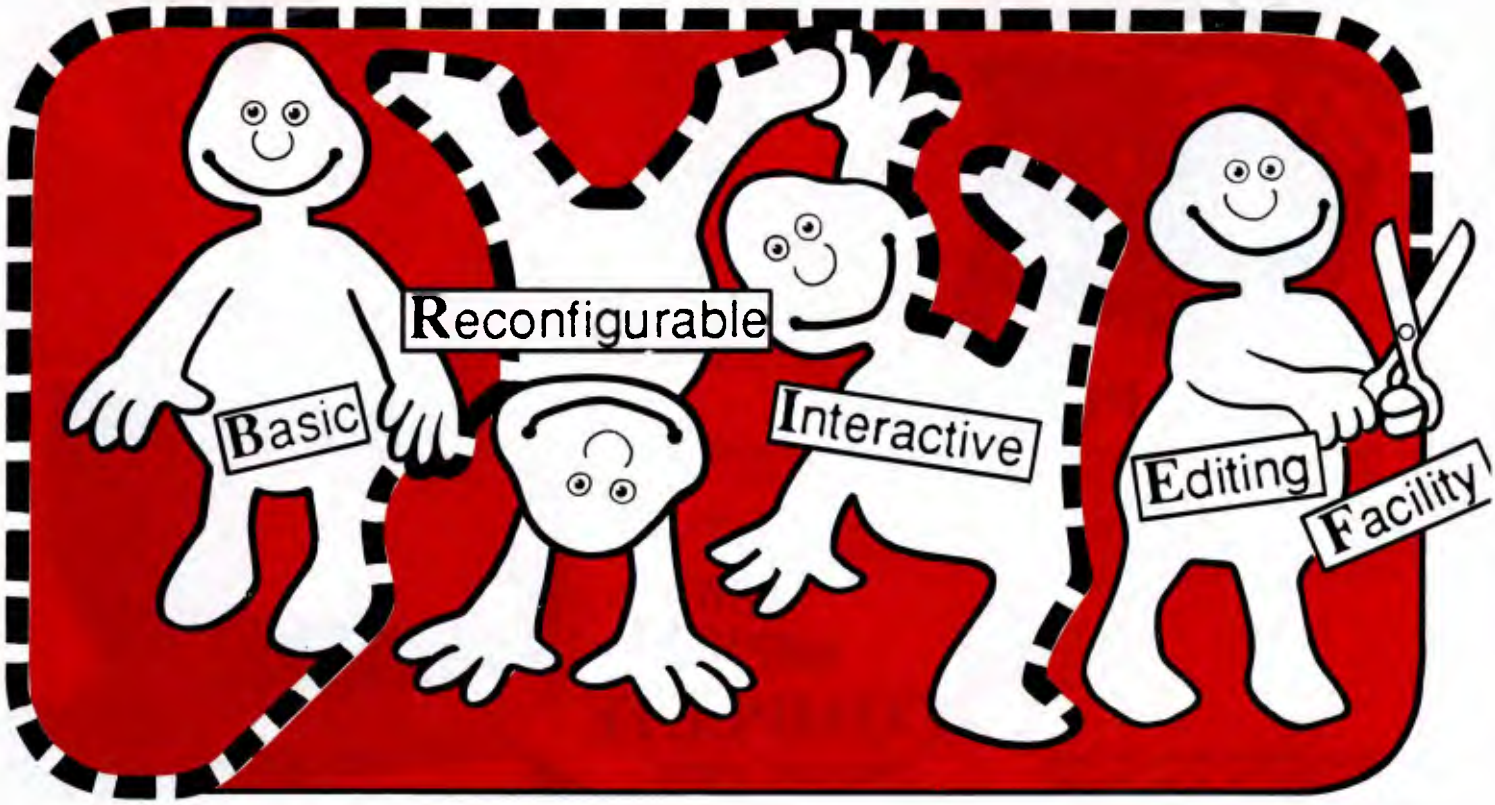
EDS won't be specific about what they're doing to prevent future infections, noting, "We have security and other measures in effect; we wouldn't want to go into those. One of the things we sell a customer is our ability to secure our customers' data so we're very, very cautious with that."

Exactly. Which is why few businesses that have been attacked by viruses will even acknowledge the problem, let alone say how they countered it — or what they've done to protect against future infections.

Would you leave *your* money in a bank that had its computer system corrupted by outside software?

Moreover, no company wants to become, through foolish claims of invulnerability, The Big Test — the number-one target of those loosing these viruses on the world.

Harold Highland, Editor in Chief of 'Computers & Security' magazine and a



BRIEF offers the features most asked for by professional programmers

BRIEF has the features most asked for by professional programmers. In fact, BRIEF has just about every feature you've ever seen or imagined....

Speed: Independent benchmarks prove that BRIEF is as fast or faster than the editor you are using now. The more editing you do, the more time you save.

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Smart Indenting. BRIEF can indent your programs for you, in any language. You'll not only save time, but you will be more apt to spot errors in program structure.

Syntax Error Location. You can compile your programs from within BRIEF. BRIEF can then move your cursor to every error automatically, so you can fix the errors and get back to the compiler without wasted effort.

Windowing. BRIEF's windowing capability is unmatched. The only limit to the number of windows you can open is the size of your screen, the ease with which you can move text between them is incredible. If you find yourself working on multiple files, windowing could save you a great deal of trouble.

Multitasking Support. BRIEF works with most common multitasking programs. You can compile while you edit.

Template Editing. BRIEF can save you countless keystrokes by letting you type in abbreviations and expanding them to entire programming constructs. (procedures, loops, conditionals, etc.) Your parentheses will always pair up.

Regular Expression Search. Have you ever had to translate a program from one language to another? BRIEF has an unparalleled pattern-matching facility that's tailor made for complicated translations.

Undo. BRIEF's power doesn't lead to more mistakes. In fact, the Undo facility makes messing up virtually impossible: there is no command affecting your text that cannot be undone. (BRIEF has other safety features, like autosave and backup files, as well.)

BRIEF Version 2.1 can be swapped in and out with a single keystroke, allowing immediate compilation with even the largest compilers: Microsoft C5.0, Quick C, Turbo C, Lattice C, dBXL, FoxBASE + V.2, Clipper, etc.

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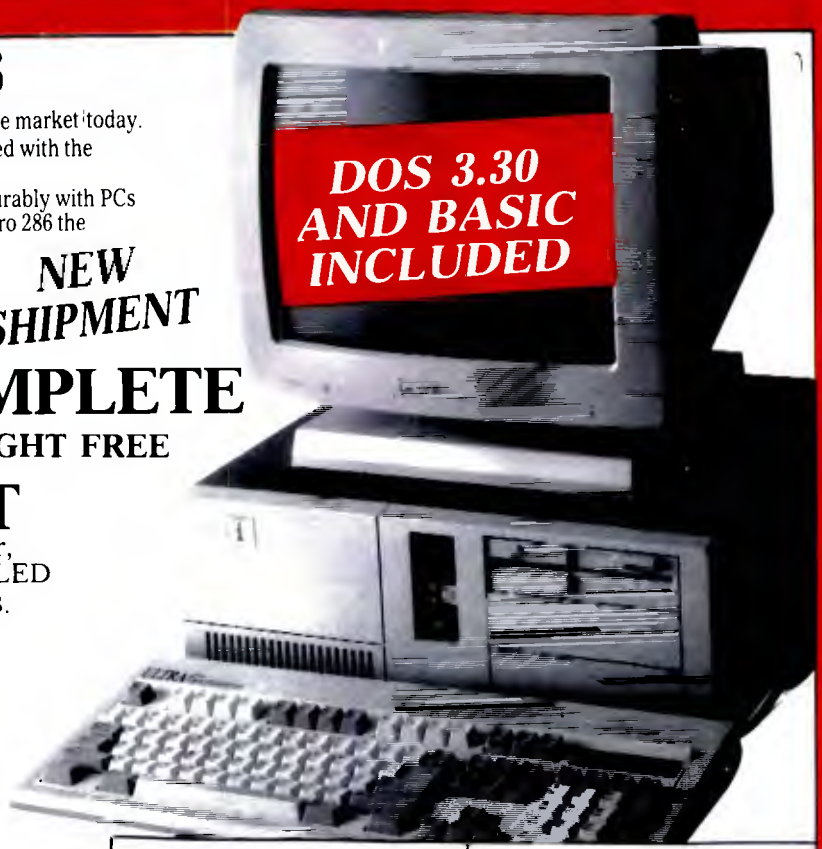

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PROTECTION

recognised expert, says it well: "My recommendation to a corporate entity would be to deny it immediately. I have advised industry that if anything like this happens, and you can kill it by denying it, then kill it.

What to do?

One corporate answer has been to ban shareware, freeware, or other programs that have been downloaded from bulletin boards. That's the new company policy at one multi-national petroleum company. The company has had scores of reports of viral infections from PC-using employees, though it has not yet been able to confirm that viruses, in fact, were responsible for the incidents. To forestall the threat, and to calm the nerves of skittish executives, the company issued a formal policy banning down-loaded software.

In academic computing settings — long the target of such vandalism — that kind of ban won't stand up. So colleges and universities have been trying to get faculty and students to use write-protected floppy disks, and to install so called 'vaccine' programs. (See anti-virus program reviews.)

Few individual PC owners will want to deny themselves the wealth of useful software available from bulletin boards, and while write-proofing your bootable floppies may be a good step, it's inconvenient and hardly a complete answer.

Common-sense measures, such as not loading new public-domain and shareware programs from unknown sources, certainly help. Most user-group disk librarians are now inoculating library disks against viral infections; if your group isn't on guard against viruses, find out why it isn't. And stop using library disks until you are satisfied that adequate security is in place.

Finally, you should consider one of the various vaccine programs. They can go a long way towards protecting your disks as well as your peace of mind. But few are available locally; none are complete answers; and none guarantee that you won't fall victim to the next round of cleverness in this escalating germ warfare.

Kenneth VanWyk again: "If you as a user recognise the vulnerabilities of the anti-virus package you're using and don't rely on it 100 per cent, then there is certainly a place for these anti-virus programs. The problem comes in when a user says, "Oh, I'm running XYZ anti-virus software — nothing can happen to me." These days, in computing, a sense of invulnerability can be a very dangerous thing.

END

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FullWrite Professional

FullWrite's features come at a price, but what does it offer in return? John Delacour reviews this 'top of its class' program.

Promised since the beginning of 1987, awarded the 1987 MacUser Editors' Choice Award for Best Vaporware, its developer (Ann Arbor Softworks) taken over by industry giant Ashton-Tate, FullWrite Professional has now finally arrived. Those pundits who have heaped scorn on FullWrite, doubting that it would ever appear, would do well to recall the Word 3.0 debacle. Ann Arbor and subsequently Ashton-Tate have tried not to repeat Microsoft's mistake of turning thousands of purchasers of Word 3.0 into unsuspecting beta testers.

Overview

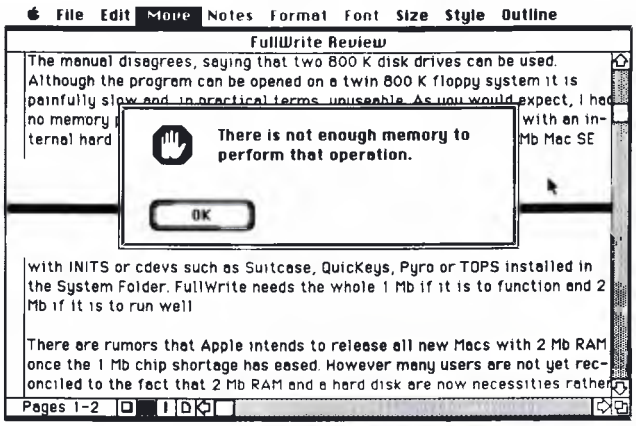
Although FullWrite has a number of disconcerting quirks, it appears to be much more stable than the initially praised though later denigrated Microsoft product. Macintosh word processors are easily separated into high and low end categories. Although MacWrite, MindWrite and WriteNow compete for the low end, Word 3.01 (recently updated to 3.02) has occupied the high ground unchallenged. Until now, Word has been the only possible choice for anyone wanting to do intensive word processing on the Macintosh. However, many of Word's features are difficult to implement or are heavily disguised. For example, not all the fonts installed in the System are listed under the Font menu. To use an unlisted font you must open the Character dialogue box and make the choice from there, or go through the tedious process of customising the Font menu. FullWrite Professional, although much more complex than Microsoft Word, is more logically designed, easier to learn and completely intuitive to use.

However, FullWrite is a memory hog, both for disk space and for RAM. Weighing in at 773k, FullWrite is one of the latest generation of Macintosh programs designed to be run on a hard disk. A note on the package states that the System Requirements are:

- Macintosh Plus, SE or II
- One 800k disk drive and a hard disk
- 1Mbyte RAM required; 2Mbyte RAM recommended
- 2Mbyte RAM required to run under MultiFinder.

The manual disagrees saying that two 800k disk drives can be used. Although the program can be opened on such a system, it is painfully slow and, in practical terms, unusable. As you would expect, I had no memory problems running the program on a 5Mbyte Macintosh II with an internal hard disk but some of the program's features could not be implemented on a 1Mbyte Mac SE and it could not be opened at all if the SE was running TOPS. FullWrite needs the whole 1Mbyte if it is to function and 2Mbyte if it is to run well.

There are rumours that Apple intends to release all new Macs with 2Mbyte RAM once the 1Mbyte chip shortage has eased. However, many users are not reconciled yet to the fact that 2Mbyte RAM and a hard disk are now necessities rather than luxuries. For them, this memory requirement will probably be FullWrite's most substantial disadvantage. Whereas Word 3.02 has an application size of 353k and a suggested memory size under MultiFinder of 384k, for FullWrite Professional the figures are 773k and 1124k respectively. The documentation warns that using large font sizes on a 1Mbyte Mac may cause a system crash and suggests that if you are using FullWrite on a Mac with more than 1Mbyte RAM and wish to ensure


File Edit Move Notes Format Font Size Style Outline
FullWrite Review
The manual disagrees, saying that two 800 K disk drives can be used. Although the program can be opened on a twin 800 K floppy system it is painfully slow and, in practical terms, unusable. As you would expect, I had no memory
with an internal hard
Mb Mac SE
There is not enough memory to perform that operation.
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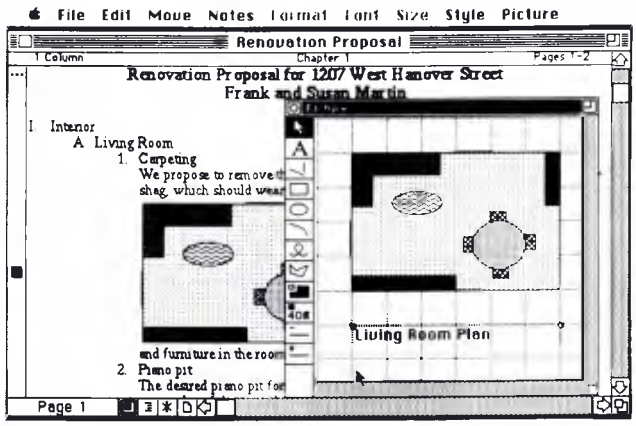
with INITS or cdevs such as Suitcase, QuickKeys, Pyro or TOPS installed in the System Folder. FullWrite needs the whole 1 Mb if it is to function and 2 Mb if it is to run well
There are rumors that Apple intends to release all new Macs with 2 Mb RAM once the 1 Mb chip shortage has eased. However many users are not yet reconciled to the fact that 2 Mb RAM and a hard disk are now necessities rather
Pages 1-2

Out of Memory message (on a 1Mbyte Macintosh SE there is not enough memory to allow selection of the show pages command)



FullWrite Professional: Picture Panel (the picture has been placed in the text and the panel has been re-opened for editing)

that the document will open on a 1Mbyte machine, you should check 'Use 1Mbyte Limit' in the Doc Setup dialogue box.

In use

There is a trade-off for FullWrite's features — but how does it compensate? Well, to put it simply, virtually everything Word does. FullWrite does more elegantly and it does a whole lot more that Word can't do at all. The package contains three disks (Application, Dictionary and System); two manuals (Learning Guide and Reference Guide); a Keyboard Shortcuts Card; and the usual warranty cards. When you open FullWrite, an untitled document appears, with a ruler at the top showing the number of columns (the default is one) as well as the chapter and page number. The chapter is the basic component of a FullWrite Professional document and chapter rulers indicate the beginning of each new chapter. FullWrite uses a virtual memory system — each chapter is loaded into memory as needed so chapter length is determined by your Mac's RAM. Keeping chapters short (about 25 pages on a 1Mbyte machine) allows documents to be larger than the Mac's memory capacity and speeds up the program's operation. This does cause a problem which I'll discuss later.

At the bottom of the document window are four small icons which control the screen display. Clicking on the appropriate icon activates one of FullWrite's screen displays:

- the Icon Bar Display (the icon bar is a vertical bar along the left margin of each column of text containing icons representing notes or rulers in the document);
- the Outline Bar Display (this contains a bullet for each item in an outline — items can be manipulated using these bullets);
- the Change Bar Display (this black or grey vertical line indicates changes made to the document); and
- the WYSIWYG (What You See Is What You Get) Display (the document is displayed exactly as it will print).

FullWrite opens a variety of file types including:

- Microsoft Word versions 1.05, 3.01 and 3.02
- MacWrite versions 2.2, 4.5 and 5.0
- various Multimate versions
- ASCII text files.

It will save files in its own format, as FullWrite Professional Stationery (this allows a custom formatted document to be opened every time the New command is selected from the File menu) and as in the following formats:

- MacWrite 4.5
- text only
- ASCII text.

FullWrite has the full range of features one would expect in a sophisticated word processor but it is how these features are implemented that makes the program so smooth to use. The Show Pages command displays two pages simultaneously — a horizontal scroll bar at the bottom of the window allows you to scroll to a specific page. Print Merge is done through a series of dialogue box choices rather than through complex formatting thus avoiding Word's tedious Option-\ and Shift-Option-\ commands. The Set Margins dialogue box can be accessed from Page Set Up or by double-clicking the chapter ruler.

When the Glossary command is chosen from the Edit menu, a Glossary window appears which contains two additional menus — allowing the user to create glossary entries which can then be saved in specially created glossary files. The program automatically hyphenates as you type and this feature is optional. It is also possible to hyphenate and to dehyphenate text selections and to specify that certain words never be hyphenated. For some reason I was unable to hyphenate capitalised words (such as FullWrite!). The spelling checker works from a 100,000 word dictionary and shows the word in context (this feature can be turned off to speed checking). User and document dictionaries can be created and each can be edited. However, the spelling checker does not work interactively and unfortunately, there are major incompatibilities between FullWrite and Coach Professional. FullWrite's Thesaurus contains 220,000 synonyms and has a lookup function which allows you to search for new synonyms in the hope of finding a better replacement.

FullWrite's search and replace capability is style sensitive and includes wild card searches — it is thus possible to tell FullWrite to look for an undefined word or group of words (by entering multiple wild card characters). The Find, Change window has four submenus (labelled Look, Match, Affect, and Action) which allow text attributes to be matched and changed. In practice you could ask FullWrite to find all 14-point Times Bold text and reset it in 12-point Helvetica Outline.

Text justification, line spacing, tabs and new rulers are selected from the Format menu. A new ruler is inserted whenever new margins, indentations or tabs are required. In FullWrite, different tab types are created by using combinations of the Command and Shiftkeys while clicking

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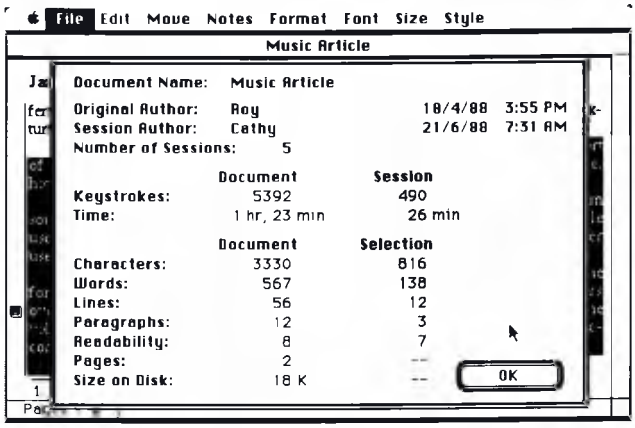
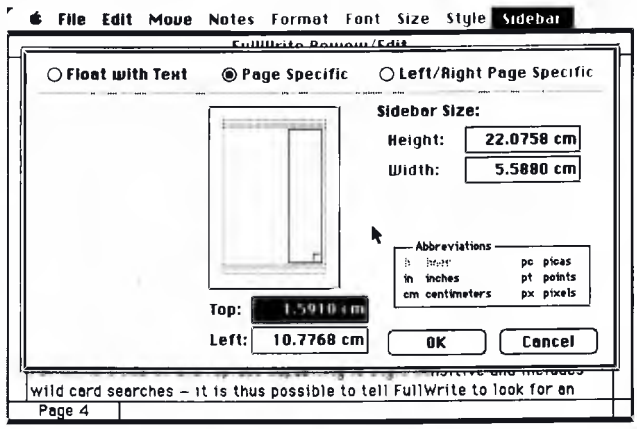


Get Info box (statistics are given for entire document and any selected text)



Side bar dialog box (note that sidebars can be page specific or set to float with text)

and dragging the one tab symbol. If a New Ruler is chosen when text is selected, FullWrite inserts two tab rules — one open rule before and one closed ruler after the selection. This makes it simple to change tab settings or margins for a block of text, then to go back to the original settings without having to manually insert a second tab ruler. Column and page breaks are easily inserted using commands from the format menu. Not only does FullWrite repaginate automatically but each page appears as a separate entity, with a 2mm gap between pages and the normal grey desktop background.

Text styles

In a FullWrite document there are three methods of defining text styles.

- Most simply, style and formatting commands can be chosen from menus and applied to specific parts of a document.
- Custom styles operate in a similar fashion to Styles in Word — commonly used styles and formats can be defined, named and saved for repeated use. Custom styles appear at the bottom of the Styles menu and can be edited, deleted or exported to other documents.
- Base styles are used to define styles for the main document and for the variety of special subdocuments which, in FullWrite, are called notes. The ability to embed text and/or graphics within a document in the form of notes is one of FullWrite's most valuable features.

There are ten types of notes: headers, footers, posted notes, footnotes, endnotes, bibliography notes, contents notes, index entry notes, pictures, and sidebars. Once an appropriate command is selected from the Notes menu a small empty window, called a panel, appears in which the relevant material can be inserted. Text styles and formatting can be specified for all but the last two types of notes. The formatting is applied using the Format, Font, Size, and Style menus once the Base Styles dialogue box has been opened. The main document could be set in single spaced 12-point Palatino plain, the footnotes in single-spaced, 9-point Helvetica Bold and the bibliography entries in 10-point Palatino Italic. Notes can be placed within other notes of the same or different types, giving enormous flexibility. As I edited this review, I placed any deleted text in a posted note so that it could be re-inserted easily if necessary.

Technical and academic writers will appreciate features such as: automatic footnote and endnote numbering; straightforward generation of tables of contents, bibliographies and indexes; dynamic updating of footnotes, endnotes and tables of contents. Hierarchical indexing is supported so that sub-listings can be created for index entries. All writers will like FullWrite's smart quotes and the information provided by the Get Info command including character, word, line, and paragraph count for the document and any selection, though some may wish the readability index was optional. FullWrite can save automatically at user defined intervals, do optional automatic backups on save, and revert to the last saved version of a document. Multiple windows can be organised on the screen in six different ways using the Clean Up command.

Although I regard Acta as the best outliner available, FullWrite's outlining is quite well implemented and is vastly superior to Word's. The bullets in the outline bar display can be hollow, black or grey, depending on whether the item has subordinate topics and is expanded or collapsed. It is possible to have multiple outlines within a document and there is a large range of user defined labelling styles. However, an outline item seems to occupy the blank space at the end of the line above so that the item's text style also applies to that space. If you are editing an outline extensively, this feature can cause inconsistent typestyles. It also means that to delete an item the cursor must be dragged from a position on the line above the item you wish to delete. Acta allows an item to be selected by clicking on its bullet. Still, I probably will forsake Acta because FullWrite's outliner is so well integrated into the rest of the program.

Bridging gaps

But finally, what makes FullWrite truly exciting and revolutionary is the way in which it bridges the gap between conventional word processors and sophisticated page layout programs. You can have multiple columns on screen. By using what Fullwrite calls 'sidebars' — text distinguished from the main body of the document by different formatting or by a border — you can have different numbers of columns in separate areas of the same page. Sidebars can contain graphics as well as text and FullWrite can flow text around graphics. The white space between text and sidebar can be specified, from one to 864 points. Borders around sidebars can have square or round corners and drop shadows.

Although FullWrite does not have automatic kerning, you can kern all occurrences of a character pair by combing the Kern command with the Find, Change procedure. Text can be printed in grey scale (from one to 100 per cent) on a laser printer. FullWrite allows you to

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specify a gutter and can print collated, reverse order and double sided. It will print registration marks if required and can print a PAINT, PIC or EPSF image as a background picture.

FullWrite also possesses a set of MacDraw-like, object-oriented drawing tools which are accessed by selecting New Picture from the Notes menu. A picture panel immediately appears (with the drawing tools along its left edge) and a new Picture menu is added to the menu bar. Arrow, text, line, rectangle, oval, arc, and polygon tools as well as line thickness and fill pattern icons are included. But the big surprise is a Bezier curve tool, in a word processor! There is also a tool which places an arrowhead at either or both ends of lines, arcs, and Bezier curves. Objects can be manipulated using commands in the Picture menu. They can be grouped, sent behind or in front of each other, locked (to prevent alteration), aligned on both vertical and horizontal axes, rotated, flipped, and duplicated. Bit-mapped graphics can be imported through the clipboard.

The glitches

It can't be all good news, so what's wrong with FullWrite? Well, there are a few glitches. The program's great claim is that it is truly WYSIWYG — however, I did uncover a problem with printing on an ImageWriter II. No matter what margins I set, FullWrite always printed the right margin 1.5 to 2cm wider than specified. Then I checked the manual. FullWrite requires you to check the Tall Adjusted option in the Page Set Up dialogue box. That solved the difficulty with margin but Tall Adjusted text looks terrible and not at all like the screen display. FullWrite is not WYSIWYG with an Image Writer, though it works well with the LaserWriter and the Personal Laser Printer. Another minor bug occurs if you save a document as 'Text with Carriage Returns' — most lines have an extra space at the beginning of the line.

A further problem I encountered was FullWrite's habit of writing large temporary files into the System Folder. Most of these were about 220k but a few were around 530k. Imagineering's Technical Support staff informed me that these VM files are created as a consequence of FullWrite's virtual memory system. Since I have a large hard disk, it was more of an irritation than anything else. But for the average user with a nearly full 20Mbyte hard disk, these temp files, could prove to be a major headache. Imagineering are talking to Ashton-Tate about the size of the VM files.

Conclusion

What would I like to see change? I'd like smaller temp files, WYSIWYG on the ImageWriter, an Expand All function in the outliner (as it is, the Expand command only expands the first subordinate level), the ability to specify Style for different outline levels, a Show Clipboard command and MindWrite's ability to copy from the cumulative clipboard, and a customisable menu like Word's Work menu. All on an 800k floppy.

So, who needs FullWrite Professional? Anyone with a 2Mbyte Macintosh and a hard disk and access to a laser printer, who needs a sophisticated document processor with a variety of graphic design features. Is it an alternative to Ready, Set, Go! or PageMaker? Perhaps, as long as your page layout requirements are relatively simple and you do not wish to work with scanned images in TIFF format. With that proviso, and taking into account the limitations already mentioned, FullWrite is a beautifully implemented program whose high degree of internal consistency makes it extremely easy to learn and use. For word processing on the Macintosh, FullWrite Professional stands at the top of its class.

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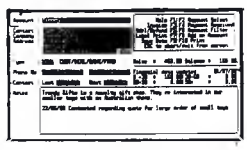

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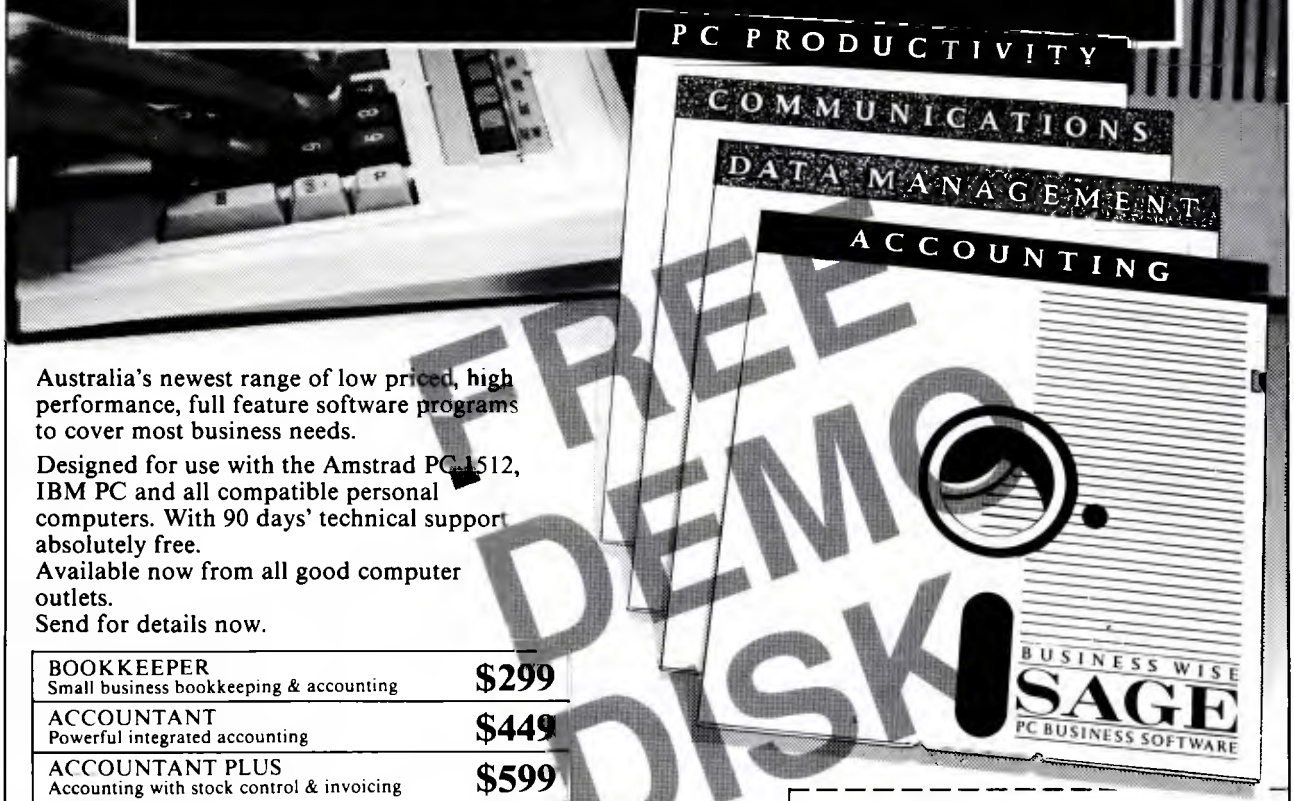

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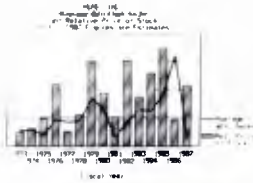

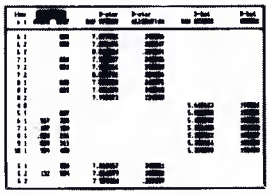

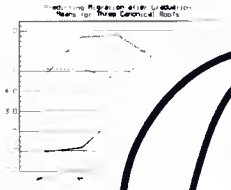

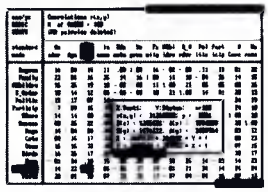

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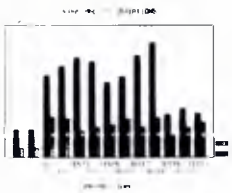

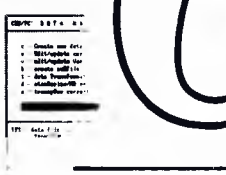

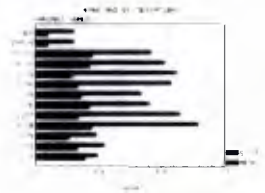

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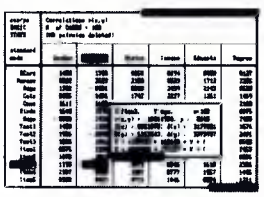

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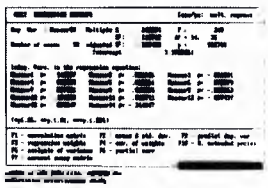
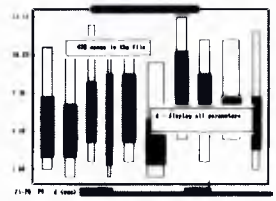
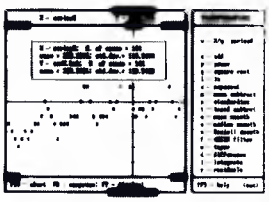
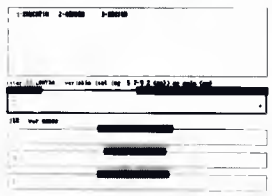




- All statistical procedures are integrated with fast data base management and instant, presentation quality graphics; full support for all mono and color graphics boards (incl. VGA) and over 100 plotters and printers (incl. the HP and Postscript standards).





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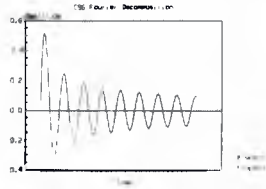
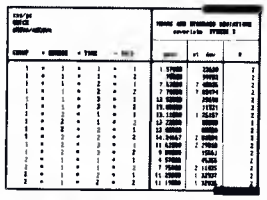
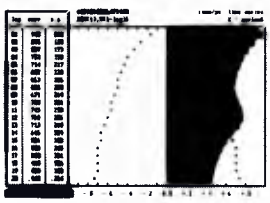
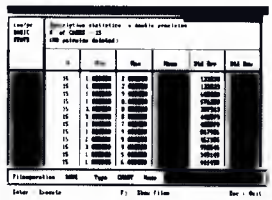




- The flexibility of the CSS input/output is practically unlimited: CSS offers an intelligent interface (read/write) to all common file formats (Lotus, Symphony, dBII, dBIII+, DIF, SYLK,...) and special utilities to easily access data from incompatible programs; graphics can be saved in files compatible with desktop publishing programs (Aldus, Ventura).





- CSS data files can be as large as your operating system (DOS) allows; OS/2 version coming soon.
- CSS precision exceeds the standards of all common precision benchmarks.
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A Turbo TSR

Scott Ladd shows how Turbo Pascal 4.0 has everything you need to craft your own TSRs.

Terminate-and-stay-resident utilities are popular among users of the IBM PC family of computers, and it's easy to see why. A TSR can fill just about any utilitarian need you have: spelling checker, keyboard macro generator, pop-up calendar and notepad, special device driver, LAN manager, and the list goes on. What's the secret behind the TSR's flexibility?

A TSR performs some sort of task, either automatically (in response to some interrupt) or when you request it. After it has executed, it returns control of the system to MS-DOS but remains resident in the computer's memory. Since MS-DOS is a single-tasking operating system, a TSR can provide a limited level of multi-processing.

By their nature, TSRs violate many rules of 'proper' programming. They often commandeer system resources that documentation clearly states should *not* be commandeered, and they can interrupt an unsuspecting program. However, with careful planning and design, you can create a TSR that minimises its impact on the other programs running on your computer.

Nearly every programmer I've talked to has had the desire to write a TSR program. Until recently, most TSRs were written in assembly language, which requires some fairly advanced technical skills. With the advent of Turbo Pascal 4.0, you can now write a well-behaved TSR entirely in a high-level language.

The advantage of this is the ease of code creation and maintenance. Turbo Pascal 4.0 (for the remainder of this article, any references to Turbo Pascal will mean version 4.0) provides many facilities applicable to creating TSRs; facilities the programmer would otherwise have to spend hours creating (see the accompanying box 'Turbo Pascal 4.0'). I believe these conveniences far outweigh the only disadvantage of using Turbo Pascal to create a TSR: larger program size. It adds about 8k to the resident size of a TSR, although this becomes less important as the size of the TSR increases.

Case study: the Quick Time TSR

The TSR that I designed displays a clock on a PC's CRT when you press a special key sequence known as a 'hot key'. Once the clock appears, you can press any key to make the clock vanish and return control to the interrupted application. I call this TSR Quick Time (QT for short), and, although it is not terribly complex, it has all the elements found in more complicated TSR utilities:

- A hot key activates the program.
- Since QT will make changes in the video display, the program saves the current display and cursor of the underlying application, then restores them upon exit.
- QT can determine if it has already been installed and will not allow multiple copies of itself in memory.
- MS-DOS is not re-entrant — meaning it must not be interrupted by a TSR when it is in the middle of doing something. QT will not activate during critical MS-DOS activities.
- If QT is already activated, it will not allow itself to be activated 'on top of itself'.
- You can de-install QT (remove it from memory) when you no longer need it.

Pseudocode for Quick Time is in Listing 1. The complete source for QT is available on Microtex (see page *6663#), or by sending a stamped, self-addressed package and formatted, 5.25in disk to Jean Lowers, *APC*, 124 Castlereagh Street, Sydney, 2000.

'A TSR can fill just about any utilitarian need you have: spelling checker, keyboard macro generator, pop-up calendar and notepad . . .'

Getting your toe in the door

From the user's standpoint, installing a TSR program proceeds in the same way as executing a normal program: you simply enter the name of the program at the MS-DOS prompt. A normal program goes about its business and when finished, frees the memory it was using. A TSR program, however, does several things before returning control to the system. For instance, QT does the following:

1) It checks to see if a copy of itself has already been installed. If so, it aborts the installation.

2) It determines the type of video adaptor installed.

3) It intercepts required interrupt vectors and re-routes them to its own interrupt handlers. For example, QT captures the keyboard interrupt to watch for the hot key.

4) It locates the 'INDOS' flag. This is an undocumented feature that QT uses to determine if it can interrupt MS-DOS.

5) It terminates using the Turbo Pascal procedure 'Keep', returning control to MS-DOS and remaining resident in memory.

It is essential that a TSR determine whether or not a copy of itself has already been installed. Unfortunately, MS-DOS has no built-in functions for identifying which programs are in memory. Some TSRs search through the memory allocated for an identifying sequence. This is a slow method that may not work with all flavours of MS-DOS. Other TSRs check for special codes in and around the entry points to specific interrupts. That method is simple to implement in assembly language, but very difficult to use from a high-level language such as Turbo Pascal.

QT uses an entirely different method. BIOS interrupt 11 hexadecimal returns the equipment status word from a fixed location in low memory. When first installed, QT intercepts interrupt 11h and watches the CX register for a special 2-byte code. If QT receives this code, it places a second (answering) code in CX. In any case, QT will load the AX register with the equipment status word, so that any program calling this interrupt will still get the proper information. The first thing QT does when executed is load CX with the first code, execute an interrupt 11h, and then look for the response code. If CX does not contain the response code, QT knows that it has not been installed, and so it proceeds normally. Otherwise, the installation terminates with an appropriate message. You can use this method for multiple TSRs by just changing in the request and response codes ('InstCode1' and 'InstCode2' in QT's source code).

'It is essential that a TSR determine whether or not a copy of itself has already been installed.'

QT displays information on the screen, and so must save the display of the current application when activated. QT gets the current video mode using function 0Fh of BIOS interrupt 10h. If the mode is 7, QT knows it is dealing with a monochrome adaptor with video memory beginning at segment B000h. Otherwise, QT knows it is dealing with a colour adaptor (CGA or EGA) whose video memory begins at segment B800h.

Next, the program must intercept several interrupts. You can declare a Turbo Pascal procedure to be an interrupt handler by using the 'interrupt' statement in the procedure definition. An interrupt handler must save all registers when called, and return using a special 'IRET' (interrupt return) function. The 'interrupt' statement tells Turbo Pascal to handle all this automatically.

QT uses the Turbo Pascal function

```
START:
  Display heading;
  Call INITIALIZATION;
  If INITIALIZATION = TRUE then
    Tell user of successful install;
    Terminate and stay resident {Use
     Turbo Pascal's KEEP procedure).
  else
    Tell user of failure;
    Exit.

INITIALIZATION:
  If QT already installed then
    return FALSE.
  Set display buffer based on video mode;
  Reroute INT 28H vector;
  Reroute INT 11H vector;
  Reroute INT 09H vector;
  Locate the INDOS flag;
  Store location of QT's stack;
  Set BUSY to FALSE;
  Return TRUE.

INT28: {INT 28H handler}
  Clear interrupts;
  Call original DOS INT 28H handler;
(A):
  If BUSY = TRUE and HOTKEY pressed then
     call DEINSTALL.
  If BUSY = FALSE and HOTKEY pressed and
  current video mode is text mode then
   Begin
     Set BUSY to TRUE;
     Save caller's stack;
     Set stack to QT's stack;
     Save current display {SaveScrn);
     call PROCESS;
     Restore display {RestScrn);
     Set BUSY = FALSE;
   End.
  Restore interrupts;
  Exit.

INT11: {INT 11H handler}
  Call original DOS INT 11H handler;
  If CX register has call code then
     Load CX register with response code.
  Load AX register with equipment list word;
  Exit.

INT09: {INT 09H handler}
  Disable interrupts;
  Call original BIOS INT 09H handler;
  ...
  (Remainder of code identical to (A) in
   INT 28H HANDLER routine.)

PROCESS:
  Turn the cursor off;
  Repeat
    Get current time;
    Position output location;
    Display time;
  Until key is pressed.
  Restore the cursor;
  Exit.

DEINSTALL:
  Save caller's stack;
  Set stack to QT's stack;
  Turn cursor on;
  Restore screen;
  Restore original INT 28H, 11H, and
  09H vectors;
  Deallocate QT's memory;
  Restore caller's stack;
  Exit to DOS {Use Turbo Pascal's
```

Listing 1 Pseudocode for Quick Time

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Turbo Pascal 4.0

Here's a quick list of the Turbo Pascal 4.0 features that relieve some of the burdensome work of writing a TSR:

- 'GetIntVec' — This procedure accepts an interrupt vector number (must be in the range 0-255) and returns the address stored at that vector's location.
- 'Interrupt' — Not a procedure itself, the 'interrupt' directive defines a user-written procedure as being an interrupt handler. Such a procedure automatically saves all registers upon entry and initialises the DS register.
- 'PrefixSeg' — A predefined word variable that contains the segment address of the Program Segment Prefix.
- 'SetIntVec' — Inverse of 'GetIntVec'. You pass an interrupt vector number and the address of an interrupt service routine (ISR) to 'SetIntVec'. The ISR becomes the new interrupt handler for the vector.
- 'Keep' — This procedure calls the DOS terminate-and-stay-resident function (interrupt 21h, function 31h). The program's code, data, and stack segments remain in memory, and control returns to DOS.
- 'Halt' — Stops the program and returns control to the operating system.

'GetIntVec' to obtain a current interrupt vector address. QT saves the vector (a pointer to the interrupt handler code in the BIOS) and 'wires' a new interrupt handler into the interrupt. I used the Turbo Pascal 'SetIntVec' procedure, which assigns a Turbo Pascal procedure's address to an interrupt. In this way, any program that calls the old interrupt will pass through QT's new handler code, which transfers control to the saved vector. This keeps other programs that use the same interrupt from being 'cut off'. When you de-install QT, it restores the old interrupt vector.

QT intercepts three interrupts: 11h, used for determining the TSR's installation status (see above); and interrupts 09h and 28h, so that QT can watch for its hot key. (Pressing a key invokes interrupt 09h. Interrupt 28h is the MS-DOS 'idle' interrupt; the operating system calls this interrupt when the system is at the DOS prompt, waiting for a key.)

An undocumented MS-DOS function, 34h, retrieves the address of what is known as the 'INDOS' flag. This counter represents the number of currently active MS-DOS functions. MS-DOS is non-re-entrant. Stated simply, this means a program cannot interrupt an MS-DOS procedure in progress to call another MS-DOS procedure. QT's 'Int09' interrupt handler uses the 'INDOS' flag to avoid interrupting MS-DOS when it is busy (eg, when INDOS is greater than 0). The TSR has to be clever, however, because 'INDOS' is set to 1 whenever since MS-DOS is awaiting input at the DOS prompt. However, since MS-DOS periodically executes an interrupt 28h while waiting, and since QT intercepts this interrupt, the TSR can deduce when it's safe to activate.

Finally, QT sets a 'Busy' flag to FALSE, indicating that the TSR is inactive. (The 'Int09' and 'Int28' interrupt handlers check the 'Busy' flag to ensure that QT is not activated while it is already active.) It then calls Turbo Pascal's 'Keep' procedure, which calculates the program's size and uses MS-DOS interrupt 21h, function 31h to terminate the application and keep it resident. You can use Turbo Pascal's $M directive to set the size of a program's stack and heap (where the program keeps dynamically allocated variables); I have set each to 1k. If you're writing a more complex TSR, you'll probably need to set your stack and heap size to some larger value.

Pop it up

The interrupt-handling procedures 'Int09' and 'Int28' watch for QT's hot key. When either interrupt is invoked, the handler executes the 'CallInt' function (which I wrote in inline code) to execute the original interrupt handler. Upon return from the original handler, QT compares the hot key code in constant 'Activate' against the keyboard status byte. Each bit in the keyboard status byte represents the current state of the shift and toggle keys. The 8 bits are mapped as shown in Table 1.

QT looks for the value 0Ah in the status byte, which indicates that the user is pressing the Left Shift and Alt keys simultaneously. (If you're going to write your own TSR, you should make sure that different TSRs use different key combinations for activation.) QT then checks the 'Busy' flag to verify that it is FALSE, proceeds if so, and exits if not.

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As a final check, the TSR confirms that the video display is in one of the text modes. If not, QT will not activate. (Graphics modes use large amount of memory — from 4k to 256k on standard PC video adaptors — and QT would have to reserve enough memory within itself to preserve the graphics screen, making QT's memory requirements prohibitive.)

Once QT has determined that it can activate, it saves the current value of the stack segment and pointer (the SS and SP registers). QT then sets the stack to the TSRs own local stack. This is a preventative measure that guarantees there will be enough stack space for QT to execute. Of course, QT will restore the interrupted program's stack at exit time.

QT also saves the current video mode, display buffer, and cursor position using Turbo Pascal's 'SaveScrn' procedure. Because some programs (eg. SideKick) don't use the BIOS to manipulate the cursor (they talk directly to the 6845 video controller chip), 'SaveScrn' must save the position in two ways: through the BIOS, and by accessing cursor information internal to the 6845. 'SaveScrn's' counterpart is 'RestScrn', which restores the original mode, display, and cursor.

QT's 'Process' procedure handles the actual visuals. The program simply runs in a loop — retrieving, formatting, and displaying the time. The loop exits when you press any key. I've defined procedures 'CursorOn' and 'CursorOff' (using BIOS interrupt 10h, functions 1 and 3) to turn on and off the display of the cursor, avoiding a flashing cursor on the screen.

Bit	Meaning
0	Right shift
1	Left shift
2	Control
3	Alt
4	Scroll lock
5	Num lock
6	Caps lock
7	Insert state

Table 1 Format of the keyboard status word. If a bit is set to 1, the associated key is activated; if 0, it is not

Out! out! damned TSR!

Often, you will want to remove (or 'de-install') a TSR once it has become resident. This is usually done to make the memory taken up by the TSR available to other programs.

The 'Int09' and 'Int28' procedures watch all keystrokes, and if they see that you've pressed the hotkey while the 'Busy' flag is TRUE (ie, while the TSR is activated) they call procedure 'DeInstall'.

'DeInstall' first restores the original screen and cursor. Then it re-installs the previous interrupt handlers for interrupts 28h, 11h, and 09h (saved during the initialisation of the TSR).

Finally, the TSR must free the memory blocks which it has taken control of. There are two such blocks: one for the program itself and one for its environment. When you execute a program under MS-DOS, the operating system places a program segment prefix (PSP) in the first 256 bytes before the program. The PSP includes several items of information, but there's only one we're really interested in: the segment program's environment block, located at an offset of 44bytes within the PSP.

Fortunately, Turbo Pascal provides a pre-defined variable, 'PrefixSeg', which contains the segment of the PSP. Using 'PrefixSeg', QT creates a pointer to both the environment block and the program block. The TSR then uses MS-DOS function 49h to free a given block of memory beginning at a specific segment. Once QT has released its memory, it exits using Turbo Pascal's 'HALT' procedure. QT is no longer resident.

There is one significant problem you can encounter when you de-install QT (or any TSR, for that matter). QT does not know if any other programs, TSR or otherwise, are loaded into memory after it. If QT is not the last program in memory when you deinstall it, a hole will be created in memory, causing the operating system to fail with the message 'Memory Allocation Error'. Your only recourse in this situation is to reboot your PC.

Termination

Using QT, it should be easier for you to develop advanced TSRs like pop-up calculators and notepads. I hope I've helped bring the writing of TSRs down from the rarefied altitude of assembly language to environs frequented by programmers who might feel more comfortable using a high-level language.

END

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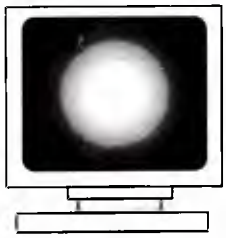

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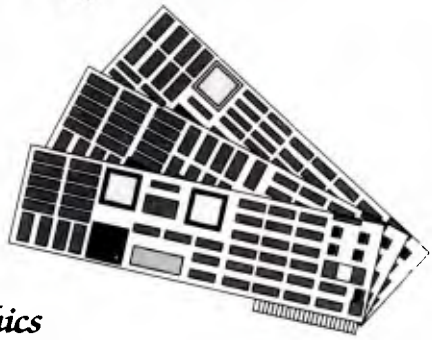

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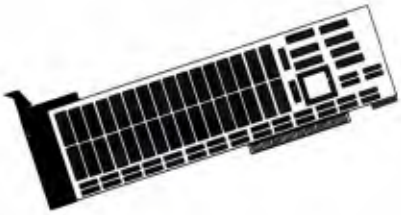

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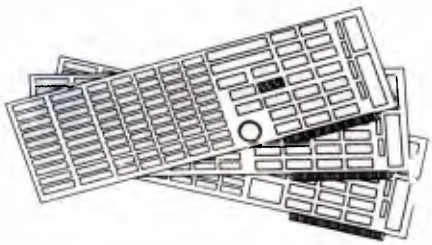

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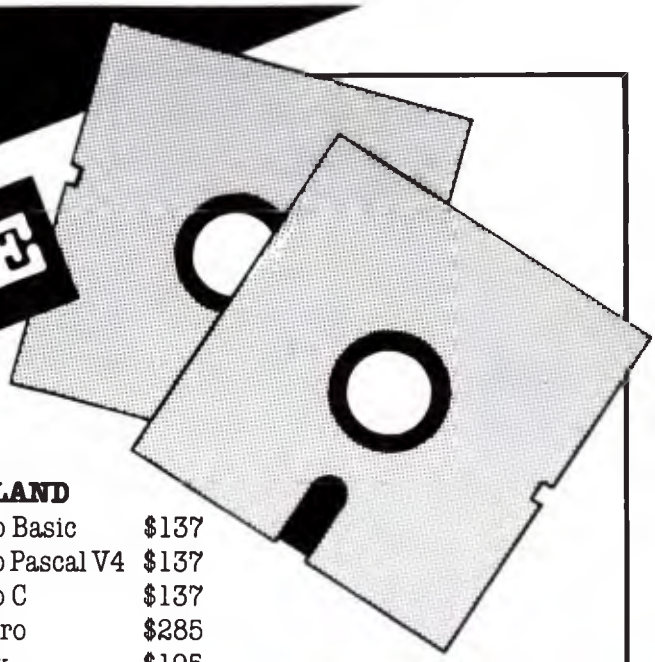

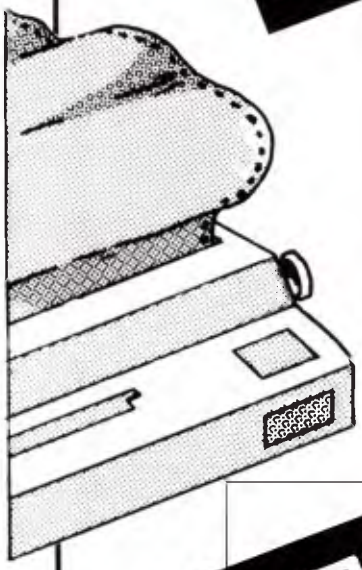

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Paying its way

In the second and final part of his spreadsheet series, Tony Meier examines the spreadsheet's range of functions — in particular, macros — and explains how you can make it work for its living.

Many users are familiar with 'what-if' analysis, but fewer are familiar with the reverse, 'goal-seeking'. Here, instead of determining *possible* end results, *specific* end results are sought.

To take a simple example, the directors of a company agree to take 20 per cent of the company's net profits as a bonus, the net profits for this purpose to be the figure after the bonus has been deducted. The problem here is to work out what the bonus ought to be, given the net profit before the bonus. Fig 1 shows the formulae needed to work this out. If you enter these formulae you will find that the problem cannot be solved using normal spreadsheet methods because circular references are involved — but it can be solved using iteration, or automatic successive recalculations of the model until a solution (or a figure as near as makes no difference) is found. The parameters needed to control this are the maximum number of iterations required, and the maximum change (convergence range) you want.

A popular goal-seeking technique, iteration recalculates the spreadsheet until a specified cell or range no longer changes (or is within the convergence range specified). That cell or range represents the goal that the model has been set up to maximise or minimise, or hit with a desired value. Iteration is extremely useful in complex situations where a large number of variables are interrelated.

What's best! is a clever add-on program for Lotus 1-2-3 or Symphony that provides very powerful goal-seeking facilities using iterative linear programming techniques. To illustrate its use, consider the following problem.

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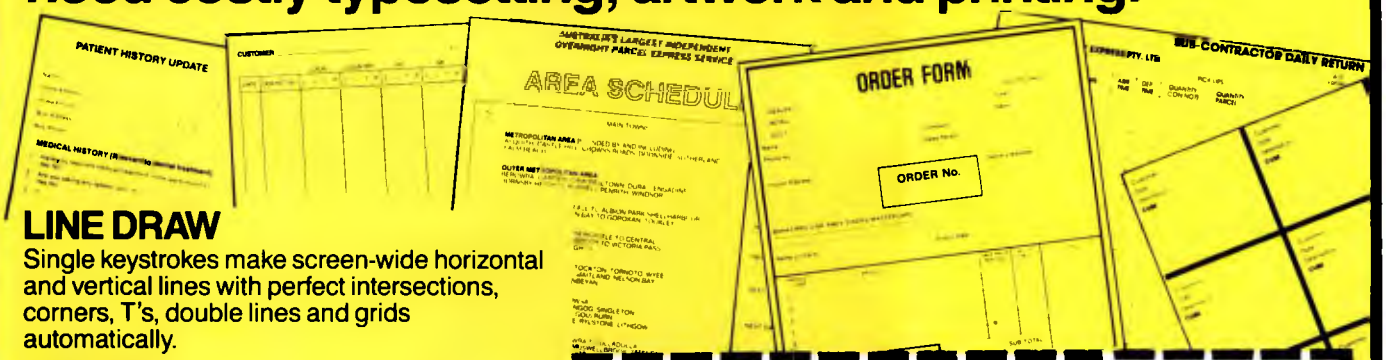

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products, tables and chairs. Each table results in a profit of $50 and each chair $20. In order to maximise profits for the coming week it would seem to make sense to produce only tables — except for the fact that there are only ten litres of varnish available for the week, and each table needs 0.75 litres of varnish as compared to 0.2 litres for a chair. In addition, there are only 30 hours available for use of the machine facilities, and each table requires two hours, each chair one hour. The problem here is to determine how many tables to make and how many chairs to make in order to maximise the profit, given the limitations on the two resources.

Fig 2 shows a spreadsheet that contains this information. You could use what-if analysis on a trial and error basis to try to maximise the value of cell D6, the total profit, but it is easier and more effective to use What's Best!. What's Best! needs to be told which cell it must maximise (D6), which cells it can change in order to maximise that cell (B5 and C5), and what resource limitations, or constraints, exist. The constraints are that the values in cells D9 and D10 must not exceed the values in cells E9 and E10 respectively. What's Best! will then iterate the model until it arrives at the optimum solution — that is, the number of tables and chairs to make to generate the maximum profit.

What's Best! can handle more parameters than this simple example shows and can be used to solve problems in complex situations.

Goal-seeking aside, in order to get the most from your spreadsheet it is important to come to grips with functions and macros.

Functions

The number and range of spreadsheet functions now available are staggering. You can use functions individually or in combination to perform an enormous variety of tasks.

The RAND function is used to generate random numbers and is both fascinating and extremely useful. The basic function generates a random number between 0 and 1 each time it is recalculated, and each recalculation generates a new number.

In order to harness the function — for example, to generate a random number between one and six to simulate the throwing of dice — you must use a formula like INT(RAND()*6 + 1).

In this formula, multiplying RAND() by six gives a random number between zero and six. Adding one and using the INT, or integer function, lops off the

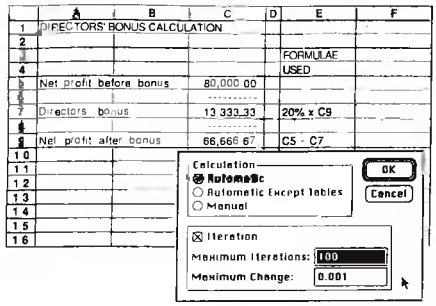

Fig 1 REVISED Goal seeking/bonuses

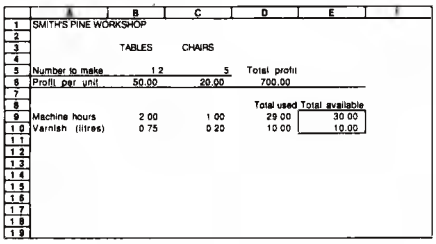
SMITH'S PINE WORKSHOP
TABLES CHAIRS
Number to make 12 5 Total profit
Profit per unit 50.00 20.00 700.00
Total used Total available
Machine hours 2.00 1.00 29.00 30.00
Varnish (litres) 0.75 0.20 10.00 10.00

Fig 2 Goal seeking/Smith's Pine workshop

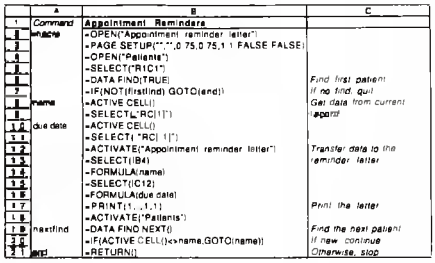

Fig 3 Dentist appointment reminders macro

decimal places to round the number down to an integer between one and six.

Of course you can go further than this — the RAND function is used to assist in the dealing of random cards from a pack in the BlackJack game described later.

The RAND function is also useful for simulating real-world events in a spreadsheet model. Real-world events like sales orders often occur at random within a given probability. One week there might be two orders, the next week none and the following week four. The RAND function is ideal for programming this kind of situation. Other events like unforeseen accidents and losses also can be programmed to provide a more realistic, true-to-life scenario which can be used to make better business and planning decisions.

Another useful function, TREND, lets you analyse relationships between sets of figures and predict future values based on those figures. Therefore, it can be used to predict share prices based on historic stock market data. For example, take the actual price of BHP on each of days 1-7. The TREND function can be used to predict the price on days 8-11 based on those figures. The formula needed to do this is:

TREND (B5:B11, A5:A11, A12:A15)

It takes the form TREND (known y's, known x's, new x's). The TREND function can also be used to predict share prices based on specified relationships such as that between BHP prices and the All Ordinaries index. Thus, if you thought that there was a correlation between the All Ordinaries index and the performance of BHP shares you could use the formula TREND (B5:B11, C5:C11, C12:C15) to predict what BHP share prices would be, given an expected set of values for the All Ordinaries index for days 8- 11.

The TREND formula gives different results depending on how much historic data you use in the formula, as the trend is based on an average of the supplied data. In general, short-term predictions are better based on a short-term trend and long-term predictions on a long-term trend. However, TREND gives a linear trend only and cannot handle cyclical fluctuations. The GROWTH function can be used to give an exponential trend where this is needed rather than a linear one.

Macros

Excel lets you build macros to create new spreadsheet functions that you can add to those already provided, which is useful if you have unique or specific requirements that existing functions cannot meet. You could create a macro function called 'PAYSLIP', for example, to calculate your net pay each month given a particular set of variables like gross pay and tax code. Functions like this can then be used in formulae in the same way as standard functions like RAND. The DigitCheck macro described later incorporates a macro function DIGIT() which is used to calculate a check digit for a given number. The check digit then can be used for verifying the number at a later stage.

However impressive the range of functions a spreadsheet can provide, macro languages are doing more than anything else to increase the power of spreadsheets by turning them into highly programmable environments.

Macros let you automate spreadsheet operations in many different ways. You

can use them for simple tasks that you frequently perform, like filling in the months of the year down a column, or you can use them to run complete applications, like the wine cellar management model described later in this article. Macro programming is similar to programming in Basic or Pascal, except that it is made easier by the provision of automatic recording facilities.

These facilities can automatically create a macro from the actions you perform. To do this you would normally tell the program to start recording, then perform the operations you want to record, and finally tell the program to stop recording. The recorded macro will then re-perform your actions when it is replayed.

These facilities are very useful in two ways. Firstly, they let beginners create macros to perform simple tasks without any need for programming know-how. Secondly, they let experienced users cut down their programming time. Such users can create one or more chunks of a large macro by using the automatic recorder, then go back to edit the recorded code.

The following macro has been created by recording the user's commands for printing a spreadsheet:

```
SELECT              Select block of cells
  ("RC:R[9]C[4]")     to print
SET.PRINT.          Set this as the print
  AREA()              area
PAGE.SETUP("",      Set up page
  "",0.75,0.75,1,     margins, etc.
  1,TRUE,TRUE)
PRINT(1,,,1,)       Print
RETURN()
```

Subsequently, it can be enhanced by editing it to incorporate a date-stamping instruction which will automatically insert the current date on the printed spreadsheet. The macro lines that need to be inserted at the beginning of the macro in order to do this are as follows:

```
SELECT ("RC[3]")
FORMULA ("=NOW()")
FORMAT.NUMBER ("d-mmm-yy")
```

These instructions are the function NOW, which always gives the current date and time, and format it to display the date in day- month-year style. It helps if you can save a macro separately from a spreadsheet — you can then use the same macro with many spreadsheets. In fact, you can build up a macro library to help you automate many of the repetitive tasks that you perform in your day to day work.

Such tasks might include entering the SUM formula at the foot of a column of numbers, providing sequences of commands for printing spreadsheet information, formatting new spreadsheets in specific ways and transferring information from one part of a spreadsheet to another.

For example, the following macro can be used to scroll down a spreadsheet diagonally towards the centre:

```
HPAGE (1)       Scroll right one screen
VPAGE (1)       Scroll down one screen
RETURN ()
```

To show the formulae in a model:

```
DISPLAY(TRUE, FALSE, TRUE)
RETURN()
```

Macros can be used to help build spreadsheet models by automating individual tasks needed to do this, like altering column widths and formatting blocks of cells. Macros can also be used to help enter data, analyse data and print out reports, as illustrated by the following example.

'TREND lets you analyse relationships between sets of figures and predict future values based on those figures.'

A dentist's reminder system

A macro might be used to help a dentist automate his work in the following way. The dentist keeps records of the appointment dates for all of his patients on a spreadsheet. Every week he needs to send reminders out to those patients whom he last saw six months ago in order to make new appointments. Rather than go through the patient list laboriously and make notes of the names of patients he needs to write to, he can set up a macro to do the job and also print out the reminder notes automatically.

The dentist needs two spreadsheets, one for the database of patients and the other for the appointment reminder letter. The database contains, among other things, the names of his patients and the dates of their last appointments. If he sets the selection criteria to the date NOW() minus six months, the FIND command will find those patients where today's date is exactly six months after their last appointment — that is, those to whom a reminder needs to be sent.

The macro that is needed is shown in Fig 3. This finds each relevant patient in turn, copies the data from the database to the reminder letter and prints out the letter. It stops when it runs out of patients, and at the end of the day it will have printed out letters for each case.

A help system

You can set up a help system for any model by using a series of macros that can jump you from the model to another spreadsheet or to another part of the spreadsheet to display a list of instructions and advice. The following macro will jump you to a location four pages across and four down to another part of your spreadsheet where you can enter notes about your model, either for yourself or for other users:

```
HPAGE(4)
VPAGE(4)
RETURN()
```

The following macro will take you back home:

```
SELECT (!A1)
RETURN()
```

You can set up an online tutorial system in the same way. When the user is finished with the instructions, a macro can take him back to where he was before.

Interactive macros

Like any other programming language, the number and range of commands available can give you a rough and ready idea of the macro language's power and sophistication.

Interactive commands provide great flexibility; a command like INPUT can be used within a macro to display a dialogue box on the screen, with a suitable prompt message for which you must type a response. The macro, having paused for your response, will use the entered data for its next action.

If the macro is being used to calculate mortgage payments, it could use a series of INPUT commands to request and obtain details of loan amount, period and interest rate.

The INPUT command might take the form INPUT (prompt, type, title) where prompt and title are the prompt and title text for the dialogue box and type is a digit representing the type of data requested. For example, 1 might be numeric data, 2 a text string.

Stopwatch

The Stopwatch macro in Fig 4 uses the

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ALERT command to display a dialogue box with the message 'Press <Return> at end of measurement'. The macro is used to record time measurements from the start of the macro (option-command-t) till the time at which the Return key is pressed. The macro enters the start time, finish time and elapsed time neatly in three columns, and automatically moves down to the next row after each recording to produce a table of timings for successive tries.

The comments in column C show how it works, using the NOW() function to record the time at any given instant.

The GOTO command lets you jump from one part of a macro to another part, or even to another macro, incorporating branching and looping in your macros.

Conditional statements like IF add a great deal of power. For example, the macro line IF(Type="W", GOTO(A7)) tests the value of a variable 'Type'. If Type is W, the GOTO function is executed and the macro jumps to cell A7 to execute the formulae it finds there. If Type is not W, the macro just moves down to the next line and executes it as normal.

Bookfinder

The Bookfinder macro listed in Fig 5 makes extensive use of IF and GOTO — if you examine the logic carefully you will see that the decision loops in the macro are nested. The Bookfinder macro is used to determine the location of any book in an imaginary bookshop. The shop has an upper and a lower level, and each level is divided into four sections.

The macro works by presenting the user with a sequence of menus to let him select the type of book he is looking for. Once the user has done this the macro displays a dialogue box on the screen showing him the location — the level and section number.

The macro uses a previously defined MENU() function macro, which is used to present the user with the options he can choose from, and a second macro called ShowLocation, which is used as a subroutine to perform the display of the location. In Excel, subroutines can be run from the main program by typing the name of the macro followed by (), as in ShowLocation().

	A	B	C
1	Command	Stopwatch	
2	\m.epar	Option-command-t Measures elapsed time.	
3			
4	time1	=NOW()	*Store current time as time1*
5		=FORMULA(time1)	*Enter time1 into cell*
6		=FORMAT.NUMBER("hh:mm:ss")	*Format the cell*
7		=SELECT("RC[1]")	*Move one cell right*
8		=ALERT("Press <Return> at end of measurement",2)	*Elicit signal from user*
9	time2	=NOW()	*Store current time as time2*
10		=FORMULA(time2)	*Enter time2 into cell*
11		=FORMAT.NUMBER("hh:mm:ss")	*Format the cell*
12	timediff	=time2-time1	*Find the difference*
13	seconds	=SECOND(timediff)+MINUTE(timediff)*60	*Calculate it in seconds*
14		=SELECT("RC[1]")	*Move one cell to the right*
15		=FORMULA(seconds)	*Enter it into the cell*
16		=SELECT("R[1]C[-2]")	*Move down to next line*
17		=RETURN()	*Stop*
18			
19			
20			
21			

Fig 4 Stopwatch macro

	A	B	C
1	Command	Bookfinder	
2	macro	Option-command-b Finds where any book in a shop is kept.	
3			
4	find	="G)eneral, T)echnical, or Q)uit"	*Define first menu*
5	inval1	=Menu(find,"GTQ","Find a Book")	*Activate menu*
6		=IF(inval1=3,GOTO(endsearch))	
7		=IF(inval1=2,GOTO(tech))	
8	general	="F)iction, N)on-fiction, C)hildren's, R)eference, Q)uit"	*Define next menu*
9	inval2	=Menu(general,"FNCRQ","General Books")	*Activate menu*
10		=IF(inval2=5,GOTO(inval1))	
11		=SET.NAME("level","Upper")	*Level location*
12		=SET.NAME("section",inval2)	*Section location*
13		=ShowLocation()	*Do subroutine*
14		=GOTO(inval1)	
15	tech	="C)omputers, B)usiness, E)conomics, S)cience, O)uit"	*Define next menu*
16	inval3	=Menu(tech,"CBESO","Technical Books")	*Activate menu*
17		=IF(inval3=5,GOTO(inval1))	
18		=SET.NAME("level","Lower")	*Level location*
19		=SET.NAME("section",inval3)	*Section location*
20		=ShowLocation()	*Do subroutine*
21		=GOTO(inval1)	
22	endsearch	=RETURN()	
23			
24	Command	ShowLocation	
25	macro	Macro subroutine	
26	message	=level&" Level, Section No."&section	
27		=ALERT(message,2)	*Display message*
28		RETURN()	*showing book location*
29			

Fig 5 Bookfinder macro

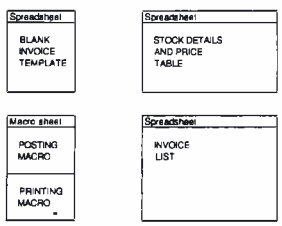

Fig 7 Invoicing application diagram

Using subroutines helps to save space because you only need to enter them once. They can then be used whenever needed by one or more macros. Using clearly documented subroutines also helps to clarify and simplify long macros.

Auto-execute macros are executed automatically on loading the worksheet or spreadsheet program. They are very useful as they can launch you straight into a model or application without having to go through initialising procedures. They can save you time and let you create models that can be used with ease by third parties while shielding them from the raw spreadsheet interface.

Documenting your macros

Documenting your macros is important as it allows you to find your way around them more easily, and makes it easier for other people to understand and alter the macros if the need arises. You may find it useful to develop a standard format for creating macros that allows for notes and comments. The macro listing in Fig 6 uses a standardised three-column format. Column A displays cell names, column B contains the macro and column C contains narrative comment.

Error checking

Error checking in spreadsheets is very important for obvious reasons, and macros can be used in many different ways to assist in checking a model and the data it contains. As far as a manual table of figures is concerned, the simplest way to check additions is to compare the total of additions vertically down with the total of additions across. The same theory can be applied to spreadsheet computations, and totals can be arrived at in two different ways so they can be checked against each other. The totals should agree and the difference should equal zero.

This resulting difference can be placed in a cell that can be checked visually or with a macro. A macro can be used to systematically check all such matching totals in a model and alert the user if errors are encountered. Errors might include missing formulae or invalid cell contents.

Macros can also be used to perform input checking. For example, where timesheet data is entered into a model, a macro can be used to check that the weekly hours entered do not exceed 40. Such a macro might use an IF statement to test whether the value lies between 0 and 40, and a GOTO command to branch off to an alert message subroutine if it doesn't.

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❑ #523 SIDEWRITER
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❑ #608 AUTOMENU ✒
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❑ #800 BAKER'S DOZEN ☆
A collection of more than 13 utilities from Buttonware

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❑ #909 & #910 dTIME KEEPER (2 disk set)
Can record time by the minute for a number of employees. Provides current accounts receivable totals and enables automatic billing of standard charges Menu driven

❑ #918 CAMBRIDGE THOROUGHBRED HANDICAPPER
Attempts to predict future performances by analyzing the past performances Also gives a betting strategy

❑ #923 PROFESSIONAL REAL ESTATE ANALYST
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For example:

```
IF (0≤number≤40,GOTO(continue),
  GOTO(badinput))
```

Therefore, a figure of 288 inadvertently typed in instead of 28 would jump you to a bad input subroutine which might activate an alert message instructing you to try again. Figures like part numbers, serial numbers and large financial amounts can all be easily mistyped.

The DigitCheck macro listed in Fig 6 checks the accuracy of the input part numbers by using a check digit which is typed in a separate cell — often the check digit is the last character of the number. In order for this to work, the part number must previously be assigned its own check digit using a special calculation based on the digits in the number, in a similar way to Personal Identification Numbers issued with cash cards. Then, when you type in the number, the macro determines what the check digit should be using the same calculation. It then compares this to the check digit you type in and, if it doesn't match, erases the data and beeps to indicate that a re- try is needed as one or more of the figures is incorrect. The comments in column C should enable you to trace the logic behind this macro.

Now for an example of a complete spreadsheet application.

Invoicing

Virtually every business needs to produce and keep track of its invoices. Fig 7 shows the four worksheets that are needed for a general invoicing application. The application will help to automate the production of invoices and keeps a record of the invoices that have been issued.

The blank invoice template contains the standard information that appears on every invoice, like the business name and address (though this might appear on pre-printed stationery) and the headings for the empty boxes that need to be filled with data when an invoice is prepared. In addition, the template contains the following formulae to assist in completing the invoice details.

The formula NOW() provides the invoice date.

Once the stock number has been input the formula:

```
IF(STOCK.NO>0,VLOOKUP(STOCK.
NO,Stock sheet!$A$13:$D$28,2),"")
```

looks up the stock number details spreadsheet and retrieves the stock description to enter into the invoice. The formula:

```
IF(ISERROR(VLOOKUP(STOCK.NO,
Stock sheet!$A$13:$D$28,4)),,
VLOOKUP(STOCK.NO,Stock sheet!
$A$13:$D$28,4))
```

retrieves the unit price. If there is no data the cell remains blank. The next few rows on the invoice contain the same formulae, allowing you to enter several different stock items. The total price for each stock item is calculated automatically.

The total of all the prices, sales tax and the grand total are also calculated automatically. The invoice numbering too is done automatically by the Printing macro.

'A function like TREND could be used on the data to predict future sales and to make the appropriate planning decisions.'

The Posting macro transfers details from the invoice, when completed, to the invoice List spreadsheet, adding these details to the end of the list — the bottom row of the database. Part of the macro listing needed to do this (here transferring the sales tax amount) is as follows:

SELECT("R23C6")	Selects the sales tax box
COPY()	Copies the sales tax amount
ACTIVATE("Invoice list")	Activates the Invoice List spreadsheet
SELECT("bottom")	Selects the row at the end of the invoice list
SELECT("RC[1]")	Selects the sales tax column
PASTE.SPECIAL (3)	Pastes value only, not formula
ACTIVATE("Invoice template")	Returns to the invoice

Once the details have been transferred the Printing macro prints two copies of the invoice, one for the customer and one for the business's own records; clears the data from the invoice; and increments the (sequential) invoice number by one.

SuperCalc 4 provides a very useful 'menu' command that lets you enhance a macro application by adding a user-defined menu structure. The package comes with a disk containing a number of interesting models putting this to use, including the following.

Blackjack game

SuperCalc 4's Blackjack game is fun to play — it simulates a four-deck game between you and the dealer by randomly selecting a card number in the range 1 to 52 each time a card is dealt. It is theoretically possible for five of the same cards to be dealt in a row, but the chances of this happening are remote.

An auto-execute macro is used to start the game when you load the spreadsheet and the macro 'menu' command is used to set up the menu options. You start the game with $1000, you are dealt two cards, and you can choose between the menu options 'Stand', 'Hit', 'New game' or 'Quit'. You can select any of the options by using the cursor keys and hitting Return, or by hitting the first letter of the relevant command. Dealing the cards is accomplished by recalculation of the spreadsheet — generating a new random number — each time a card is dealt.

The display of the cards in their suits is clever — the diamond, heart, spade and club characters are obtained by using the LOOKUP function to access a look-up table containing these four alternatives. At the end of each play your pot of money goes up or down, the old cards are cleared from the table and a new set are dealt.

Wine cellar management model

Another model provided is a wine cellar management model. Here, macros are used to create a stock control application complete with its own set of menus.

The application lets you control the stock of wine in your cellar, and uses the spreadsheet as a database to display the details of each type of wine. You can browse through your stock as you would with a database, in order to choose a bottle or bottles to sell or to drink.

It displays the name, the year, the number of bottles, their cost, their value and the year in which they will be ready to drink. And the menu options let you alter the stock details, add new bottles, delete old ones or sort by year, type of wine, bin or name.

An auto-execute macro is used here, which first displays a section of the spreadsheet as an introduction screen containing a welcome message and instructions. Pressing any key continues execution of the macro which goes to the top left area of the spreadsheet con-

AUTOMATIC PRINTER SHARER

From the manufacturer of the popular Blitzer range of Modems comes a family of handy Printer Enhancement Products (PEPs).

PEPsharer, the Automatic Printer Sharer, automatically connects up to four parallel printer channels to a printer, on demand. No manual switching is needed. The four input channels could be from four computers or from a mixture of computers and any other PEP.

The input channels are polled sequentially until data is found on one channel. This active channel is then switched to the printer (or output channel), and the other channels are locked out. After data transfer has ceased for a period of time, sequential polling recommences.

PEPsharer has no operational controls or commands as everything is automatic.

The function performed by PEPsharer can also be fulfilled by PEPnet but PEPsharer provides a lower cost solution when the computers are close to the printer to be shared.

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- The output connector is a 25pin D type to suit a standard IBM PC printer cable.
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  - Desk mount rubber feet
  - Printed Manual in Proper English

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PEPswitch - To switch between printers from your keyboard

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	A	B	C
1	*Command*	**DigitCheck**	
2	*macro*	*Option-Command-X*	
3		=SELECT(,"RC[-1]")	*Move to check digit*
4	check	=ACTIVE.CELL()	*Get check digit*
5	original	=OFFSET(ACTIVE.CELL(),0,-1)	*Get first input*
6		=IF(Digit(original)<>check,GOTO(badinput))	*Is the digit correct?*
7		=SELECT(,"R[1]C[-2]")	*If sc, move down*
8		=GOTO(end)	
9	badinput	=CLEAR(1)	*If not, clear both*
10		=SELECT(,"RC[-1]")	*and move back*
11		=CLEAR(1)	
12		=BEEP()	*Beep for error*
13	end	=RETURN()	
14			
15	*Function*	**Digit**	*Calculate check digit*
16	*macro*	=ARGUMENT("number")	
17		=SET.VALUE(accum,0)	*Initialise accum*
18	odd	=FALSE	*Initialise odd*
19	loop	=IF(number=0,GOTO(checkdigit))	*"While" loop test*
20		=SET.VALUE(odd,NOT(odd))	*Switch value of odd*
21	lastdigit	=MOD(number,10)	*Find last digit*
22		=SET.NAME("number",INT(number/10))	*Reduce by one digit*
23	temp	=IF(odd,lastdigit*2,lastdigit)	*Odd digits times 2*
24	adjust	=AND(temp>=10,number<>0)	*Adjustment needed?*
25		=IF(adjust,SET.VALUE(temp,temp-9))	*If so, subtract 9*
26	accum	=accum+temp	*Accumulate total*
27		=GOTO(loop)	*Loop up*
28	checkdigit	=10-MOD(accum,10)	*Find checkdigit*
29		=IF(checkdigit=10,SET.VALUE(checkdigit,0))	*If 10, change to 0*
30		=RETURN(checkdigit)	*Return value*
31			
32			

Fig 6 The documented Digit-Check macro checks the accuracy of the input part numbers

taining the wine database, and displays a menu. From here on, the macro branches to subroutines depending on which menu option you select.

Use with other programs

With data exchange easier between different programs and machines, spreadsheets are becoming increasingly useful for analysing information from other programs. Once analysed, the data and the results of computations can be exported back to the originating program, or printed out. A spreadsheet can be a very useful tool for producing charts from information taken from other programs.

For example, a database used for stock control in a chain of sports shops might contain details of the numbers sold of a range of different sports goods, such as cricket bats and skis, in each month of the year. This data can be exported to a spreadsheet where a chart can be produced to show sales of cricket bats and skis against months of the year. In addition, a function like TREND could be used on the data to predict future sales and make appropriate planning decisions.

If you have an interest in the stock market you can create a model to import downloaded share price information from an online database. Details of several thousand stocks might be accommodated. Database and analysis functions can then be used to sort the stocks into various categories of performance according to price/earnings ratios or other indicators. Different classes of stock can be copied and transferred to other linked spreadsheets where further sorting and analysis can be performed, in order to sort good investments from bad ones. The results can be compared to previous data in order to build up performance charts to obtain additional guidance on investment decisions.

The TREND function might also be useful here. The whole procedure can then be automated by a macro, resulting in a model that can automatically analyse downloaded share price information each day and print out a set of useful reports and charts.

Spreadsheet compilers

Spreadsheet compilers are a recent development that make spreadsheet models more available and usable by third parties. They work in a similar way to program compilers. Liberty and The Baler are both first-generation programs of this kind that let you turn a completed Lotus 1-2-3 model into a finished, standalone program. And you don't need a copy of Lotus 1-2-3 in order to run the compiled model. Third parties can use the compiled model together with its macros to accomplish the tasks that it has been designed to perform — but they cannot modify it or see the hidden formulae.

The future

Software companies look set to continue developing spreadsheets well into the future, which is good news for all spreadsheet users. It means more features, more performance and more applications.

END

The ultimate link?

ISDN — a new communications technology that could change the way we use our computers and telephones. Jay Duncanson and Joe Chew explain.

You are sitting at your desk, first thing in the morning. Your computer downloads several large files from a shared hard disk over the telephone system. Sipping your coffee, you start another download from an information service, then check your electronic mail (E-mail) while the error-free transfers continue.

The telephone rings. A window pops up on your computer, telling you it's your mother calling. In the midst of the conversation with your mother, the window reappears: your division manager is calling from headquarters. Putting the personal call on hold, you and your manager discuss a new assignment, augmenting the discussion with interactive graphics.

As you return to mother's call, the pop-up window informs you that a call from a persistent salesman has just been automatically rejected. At the same time as all this is happening, your laser printer has made a hard copy of a facsimile that has come in from one of your remote divisions.

Sound futuristic? It is, but not by much. Even as you read this, functions like these are being demonstrated in field trials and actual commercial implementations of ISDN, the Integrated Services Digital Network. (The grammatically proper usage is 'an ISDN' or 'the ISDN', as if the acronym were spelled out, but most use it without remorse as a noun in its own right.)

ISDN is a technology that integrates digitised voice and data — not only computer data, but other digital information, such as fax and video. It works over simple twisted-pair wiring such as that currently in use for telephones (see Fig 1). At monthly rates from 20 per cent to 60 per cent higher (depending on the services chosen) than we are now paying for basic telephone services, ISDN will offer high-speed digital transmission and many enhanced communications services.

More than just a service

The keys to understanding the concept of ISDN are in its name. First and foremost, its services are integrated. Voice and data, circuit switching, and packet switching all come to you on one line from one source. Standards for interoperability are being developed and approved by the CCITT, or International Consultative Committee for Telephone and Telegraph, under the aegis of the United Nations.

Whereas today's conventional networks have islands of modern digital apparatus in a sea of analogue technology, ISDN is completely digital (except, of course, for certain parts of the telephone, such as the microphone, speaker, and tone pad). This approach allows performance unheard of in analogue days.

With a few local exceptions, these integrated digital services will eventually be provided over existing telephone wiring to all subscribers who want them. The first tentative commercial offerings are already in place, and ISDN lines should be available in most places by the mid-1990's. However, technical and financial problems may slow its progress.

Batteries not included

The telephone system uses the complex embedded technology you'd expect from an international network that serves hundreds of millions of people. Fortunately, to understand how ISDN affects end users, we need to deal with only two key elements: the central exchanges (electronic switchboards that route calls and provide services) and the local loop from the central exchanges to the customers' premises.

In most of the Western industrial countries, the central exchanges and the networks connecting them are well on the road to complete digitisation, a process that began in the early 1960s. Most circuits from the central exchange to the customer, though, still use the analogue technology that Alexander Graham Bell would have recognised: talking by modulating a continuous DC signal across a loop. A present-day telephone's interaction with the central-exchange switch is both limited and simple-minded, especially during a call. The burdens of knowing the state of a connection and of providing extra services, such as call waiting, rest entirely upon the switch.

Some interaction can be done with brute force, such as applying voltage to a telephone to make it ring, or interrupting the current loop to send dialling numbers. Modern extensions to this approach, like dial tones, are more sophisticated and capable, but they still tread upon the bandwidth used for the connection.

ISDN represents a fundamental severing of the ties with Bell's technology. Whereas today's conventional telephone and network services are cost-inefficient and awkwardly configured mixtures of digital and analogue technology, ISDN is a completely digital approach. Under

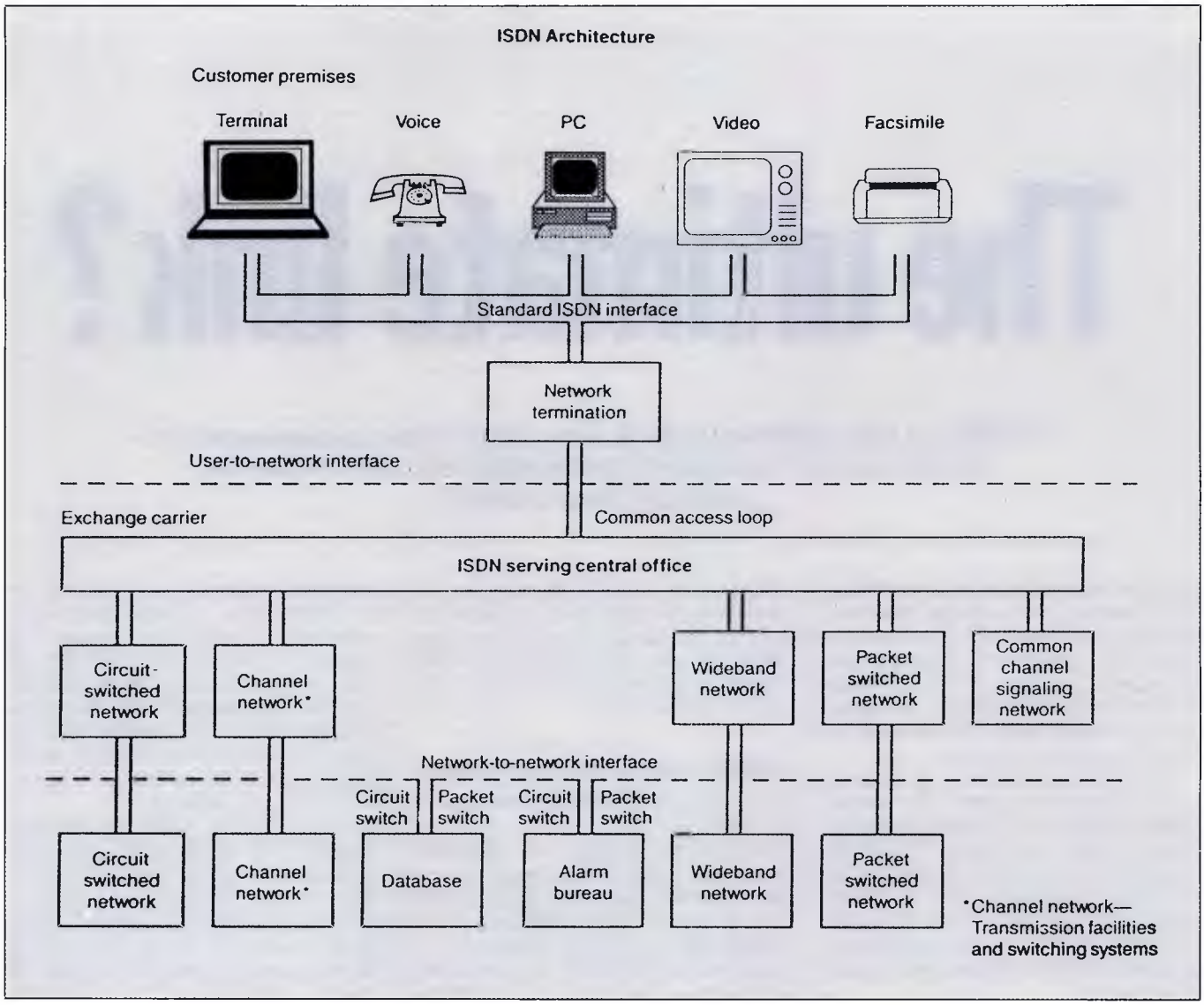

Fig 1 ISDN is an evolving international standard for voice and data communications. Its major features include integrated access of multiple services over a single access line, network transparency via standard customer-to-network and network-to-network interfaces, and end-to-end digital connectivity

ISDN, the telephone is a computer. It sends digital rather than analogue information, and it talks interactively with central-exchange switches that are themselves large, specialised mainframe computers. The difference opens many doors — and creates a few problems as well.

Since ISDN customer equipment can communicate intelligently with the switch, even during a call, it is easier to implement advanced features. Furthermore, features that are currently implemented only in proprietary ways on private branch exchanges can be provided in standard ways through the Telecom network.

This change in signaling methods has some drawbacks, which will probably be temporary. One is that different manufacturers' ISDN switches now use subtly different signalling methods. As an early ISDN customer, you would have to be aware of what is in the central exchange and set up your equipment accordingly. This situation will change, but achieving compatibility among products from different manufacturers is always slow and difficult.

Another problem is the huge installed base of 'dumb' analogue equipment that must be accommodated during the change-over period. Analogue telephone sets, for instance, will have to be adapted to ISDN or replaced with ISDN units. Interoperability between ISDN and analogue subscribers will also have to be accommodated.

In the new ISDN environment, you will be able to pick and choose the services you want. If, for instance, you are satisfied with your present telephone services, you will be able to use your telephone in exactly the same way after ISDN is installed. In order to take full advantage of ISDN's benefits, though, you will have to learn to live with the new complexity, just as you learned to cope with the esoteric features and moon-mission control panels of today's audio and video equipment.

Two types of services

ISDN services will be provided to customers in two classes: the Basic rate interface and the Primary rate interface.

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What a tangled web we've woven . . .

While drafting the ISDN specifications, the CCITT defined five interfaces — R, S, T, U, and V — that are access points into the network (see Fig A).

The R interface is an access point for existing, non-ISDN equipment (a TE2 in the CCITT specification), such as an analogue telephone or an RS-232C port, which requires terminal adaptors to tie into the network. While the other interfaces are associated with ISDN standards and are ISDN-specific, the R interface implements whatever standards are required for a particular piece of customer equipment. For example, the analogue telephone and RS-232C port, which differ greatly in physical, electrical, and logical needs, both meet the network at the R interface.

The S interface connects the ISDN-compatible equipment and the computer side of the network termination (an NT2, such as a PABX or a LAN). The T interface is where the premise-based ISDN switching equipment connects to the carrier's side of the network termination (NT1). The U interface is the connection between the customer premises and the central exchange equipment, while the V interface connects the central exchange to the rest of the network.

Both the S and T interfaces use two twisted pairs of wire, for a total of four wires. The T interface uses one pair for transmit and one for receive, to provide full-duplex operation, and it has the capacity to operate at the Primary rate.

At the U interface, the use of echo-cancellation techniques permits full-duplex operation over a single twisted pair. It operates at the Basic rate. This interface has a greater range (2500 to 6500 metres versus 100 metres for the S and T interfaces) and doesn't need that extra pair of wires. It allows the existing local loop — a single pair — to be used all the way from the central exchange to the user.

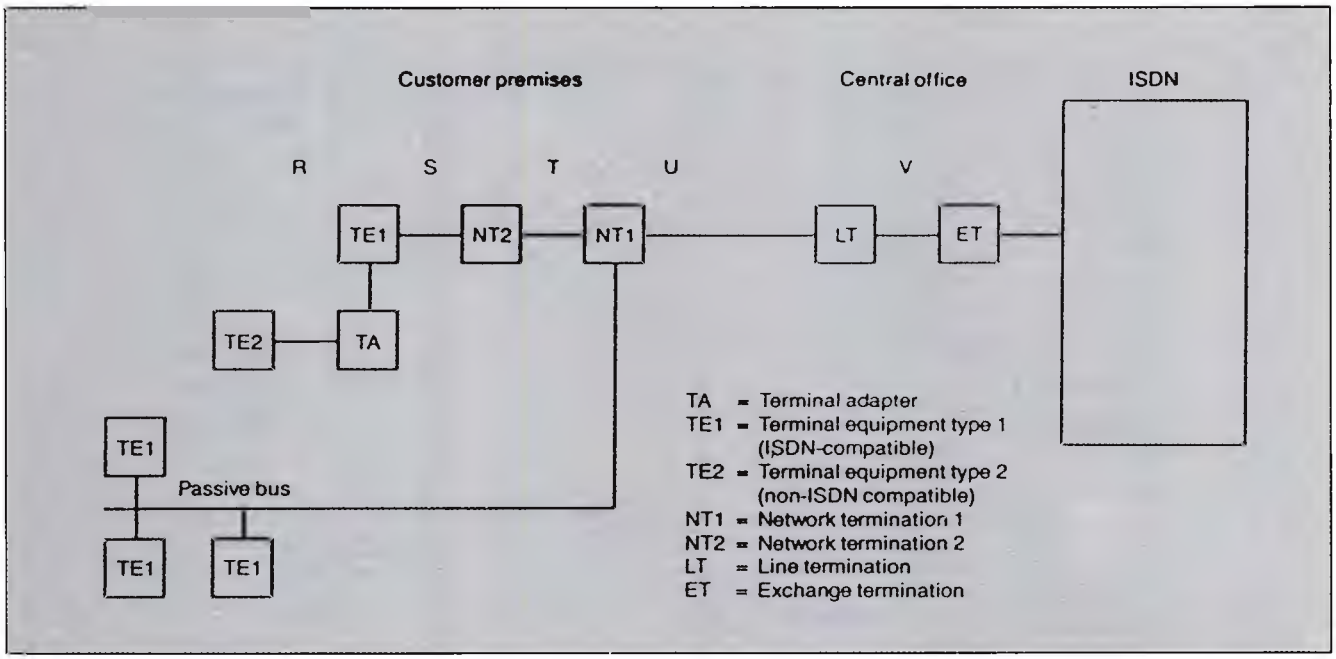

Fig A The CCITT, a communications governing body of the United Nations, has designated five ISDN reference points: R, S, T, U, and V. These are places in the network where one or more interfaces for specific functions will occur

The Basic rate consists of two 64k-bits-per-second (kbps) B channels that can carry either voice or data, and one 16kbps D channel used for network signalling and control, and user packet data. An additional 48kbps is also used for other purposes, such as echoing the D channel, synchronising the terminal units, and conveying other internal network information.

The Primary rate consists of twenty-three 64kbps B channels and one 64kbps D channel. Primary rate will support 1.544Mbyte-per- second (Mbps) bi-directional transmission rates. It could be used, for example, to interconnect computing facilities and to connect private branch exchanges (PABXes) to the network rather than to directly serve residential end users.

Basic rate access can include various combinations of circuit- switched voice, packet-switched data, and circuit-switched data. The difference between circuit switching and packet switching lies in the way the data is routed through the network. Circuit- switching technology is the closest thing to a traditional telephone connection; it can be compared to a pair of wires dedicated to a particular connection for the duration of the call. In packet switching, data bits are grouped into packets with original address, destination address, and error-control information. The packets are routed to their destinations through networks of packet switches at the central exchanges and elsewhere, taking whatever paths the intelligent network considers best at the time.

Packet switching has several advantages for data transmission. The individually addressed packets can be intermingled; packet switching is more akin to a conveyer belt in the post office than to a conventional telephone connection. Like time-sharing on a large computer or the multiplexing of several terminals onto one communication line, it keeps high-capacity facilities from sitting idle between sporadic bursts of usage.

Packet switching has other advantages as well. With appropriate equipment, the user can maintain multiple simultaneous connections over a single channel. Packet switching also opens the door for services such as remote meter reading, polled security monitoring and wide-area versions of local area networks (LANs).

Traditionally, circuit switching and packet switching have used different equipment, and in fact have reflected opposing philosophies. ISDN will be the first widely available network to integrate them.

An ISDN switch can also provide supplementary voice services such as call forwarding, conference calling, and hold — all the services now available on office telephones — plus a few more that are not currently feasible, such as pre-screening and selective answering. And ISDN can provide these services without modification of the twisted-pair wiring scheme used in today's phone service.

This seems like a trivial issue, but it is tremendously important. A substantial fraction of the world's copper production has gone into 'last mile' telephone circuits, and the labour costs of replacing it would dwarf the material costs. Despite the best-laid plans of supporters of fibre-optics, it is axiomatic that the next generation of the telephone system, whatever its other characteristics, has to work over twisted-pair wiring already in place.

ISDN and computing

Most of ISDN's impact on the public will come from voice service, which, after all, is the main business of Telecom. But ISDN integrates voice and high-speed data. For the first time, data will stand beside voice as an equal partner in the public telephone network.

Establishing data connections over ISDN from a personal computer can be accomplished with the addition of a terminal adaptor (TA). A TA is like a modem in one way: it allows the computer to talk over the telephone network. But the similarity ends there.

TAs are being designed so that existing terminal-emulation programs can work with them after little or no modification.

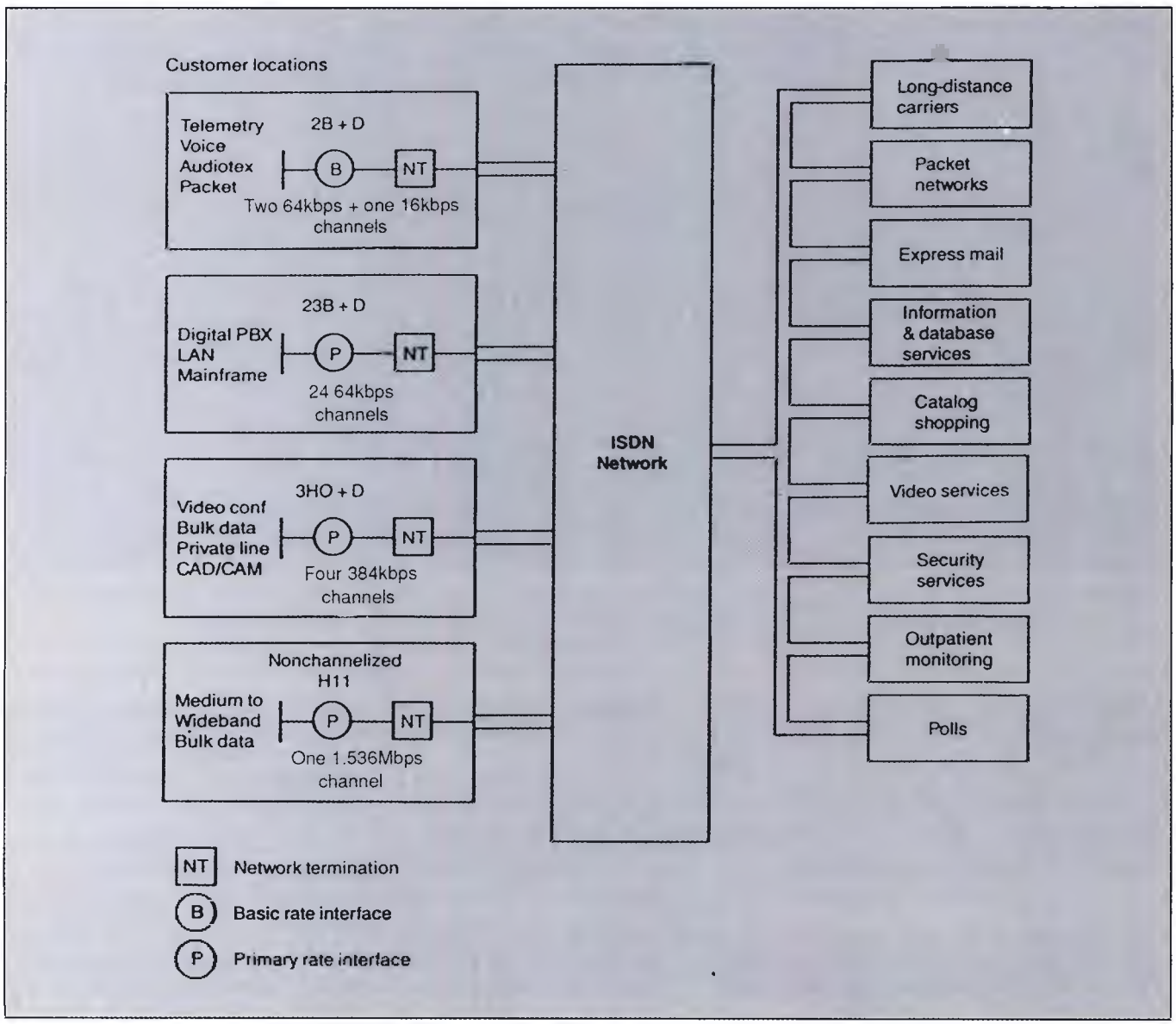

Fig 2 Many services will be available over ISDN's Basic and Primary rate interfaces when the technology is fully employed. Some of the potential applications are shown here

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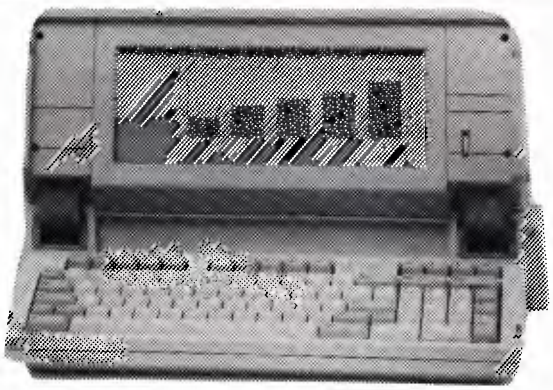

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(Generally speaking, TAs and other ISDN equipment will isolate the user from the complexities of dealing directly with ISDN.) But taking full advantage of ISDN's capabilities will call for special software that is just beginning to appear.

Take the wide-area network for instance. When you think of a LAN, you probably think of high performance, great complexity, and someone standing on a ladder in your office to run coaxial cable through the ceiling. The high-speed packet-switching capability of ISDN makes it feasible to build a LAN that runs over switched connections through the public telephone system.

Such a LAN can interconnect users across the street or across the continent. It doesn't need dedicated cables and adaptor cards — just the existing telephone wiring, plus ISDN terminal adaptors and software. And you can reconfigure the network without having to call in someone with a ladder.

Multiple simultaneous connections, each fast enough to accomplish something useful, will also become feasible under ISDN. With a personal computer running a multi-tasking (or at least multi-windowed) operating system, you will be able to exchange information with different parties simultaneously. What's more, you will be able to do so without sacrificing voice quality or capabilities.

Some computers that include ISDN interfaces and features are already on the market; they are often called 'integrated voice/data terminals'. That term, though, is also used for telephones with small displays, such as a receptionist might use.

One of the major issues of the transition years, a special case of the analogue-interoperability problem, will be connecting ISDN-equipped computers to other computers that have modems. This could be done either through centralised modem pools or by digitising the modem signal at the modem and sending it over a B channel as circuit-switched data.

The holdup

One obstacle in the adoption of ISDN comes from the financial rather than the technical side. Converting to digital technology is expensive, and the cost will have to be recouped somehow.

For the first several years, Telecom will probably get it from business users. Residential users could provide a great deal of revenue, but at present, they don't have much use for ISDN. It has been proven time and again that the celebrated Man in the Street wants nothing more than analogue voice, and at the lowest possible tariffs.

Should Telecom force this new, expensive, and perhaps intimidating technology upon residential customers who already have adequate phone service? Or should it resign itself to a long, long transition period of providing both an analogue service and ISDN while private individuals figure out what to do with their connectivity?

Thus far, ISDN has been used in familiar ways: as a more capable phone and as a faster modem. Only time will

ISDN in Australia

The adoption of ISDN technology by Telecom Australia is well advanced and Australia is leading many major countries in its commercial implementation.

Primary rate, multi-line services are already being installed between large company PABX's providing 2Mbps point-to-point transmission. It is currently available in Sydney, Melbourne, Canberra, Brisbane, Adelaide and Perth. ISDN Primary rate availability to provincial centres is planned for late 1989.

By mid 1989 Basic rate, single line services will be available in Australian capital cities. The implementation of Basic rate ISDN, providing 64kbps transmission over existing copper pair circuits, will dramatically increase the variety and quality of communications services available to the residential community. When Basic rate ISDN becomes generally available the real impact of this new technology will be apparent.

Without any rewiring of homes and businesses the introduction of ISDN will provide:

- Very high speed facsimile. Up to ten times faster than currently available and with full error correction.
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- Slow scan TV. This could provide a basic videophone capability and remote monitoring of premises or unattended machinery.

Future planned development of the ISDN technology ultimately will provide switched data transmission services at 150Mbps and 600Mbps. As an interim stage, Telecom plans to introduce a Switched Broadband ISDN service as a defined Wide Area Network within the central business districts of Melbourne and Sydney during the 1990s.

Such is the rate of technological change that even as ISDN is being introduced, Telecom already is field testing the next stage in telecommunications development, optical fibre.

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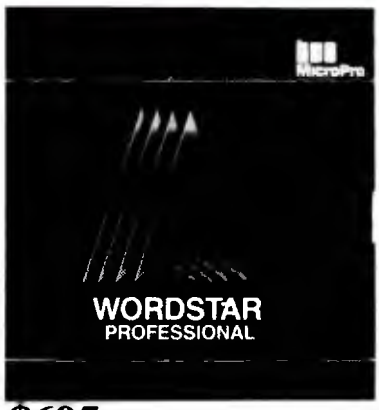

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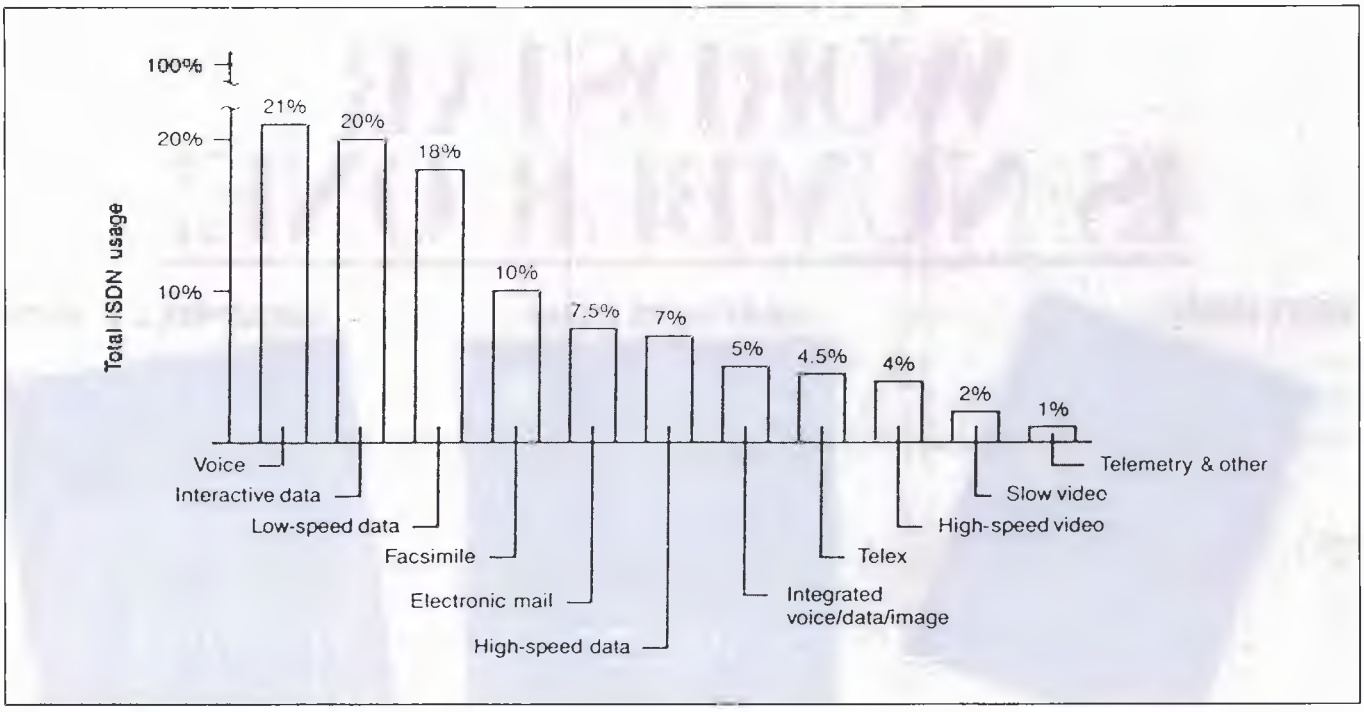

Fig 3 When ISDN is fully implemented, its largest usage will be for voice, interactive data, and low-speed data. As an emerging technology, however, ISDN may take off in directions unpredicted at this stage of the game

reveal the effects of having 144kbps of communications power in every home and office. ISDN could be revolutionary, changing the way we live and work. Then again, it could be evolutionary, merely updating the telephone without changing the familiar uses and social rituals surrounding it.

In either case, ISDN will be the hidden engine behind the changes. The changes themselves will come through applications. And therein lies the quandary and the opportunity.

The pull forward

In the marketing parlance, Telecom and equipment manufacturers are pushing ISDN, but, so far only a few venturesome companies are pulling it with demand. In a classic chicken-or-egg problem, the demand will presumably be increased by applications, but the applications won't arrive until there is a market.

Here's a look at a few of the possible applications that could pull ISDN and some of the obstacles that it would face (see Fig 2).

- *Networking:* We've already mentioned wide-area networks — LANs that use the phone lines to connect to other, more distant environments. They are much less trouble than traditional hardwired LANs, but there are disadvantages. For one thing, your connectivity habit shows up on the phone bill each month. Furthermore, they have comparatively low performance. The slowest traditional LANs run at about four times the speed of a B channel, and many users have become spoiled by the now- commonplace 10Mbps LANs, such as Ethernet.

Although its performance may not be adequate for every need, an ISDN LAN would probably serve most users quite well. However, the argument is not entirely technical. Analysing throughput needs and spotting performance bottlenecks is not nearly as difficult as changing customers' perceptions. Only time will tell if the real price/performance characteristics of these networks can overcome their pokey image.

The ISDN wide-area network might also catch on as a personal convenience. Nearly everyone who uses E-mail at work comes to love it, so how about a standard, public, nationwide E-mail system? The catch here is obvious: although embedded processors are in everything from TVs to thermostats, the computer, per se, has not entered the personal lives of many people. Since home computing has not emerged as a force strong enough to push ISDN, perhaps ISDN will pull home computing.

- *Video:* Even that old science-fiction standby, the videophone, could be born anew. AT&T showed a videophone at the 1964 World's Fair, but the technology and economics of the day would not support its commercial adoption. Granted, a 64kbps channel will not provide broadcast-quality television images, but it can transmit real-time video with acceptable resolution. Imagine working at home and 'sitting in' on a meeting at the office, or showing a document and your honest, trustworthy face to a bank's customer-service representative. Or even sending live images of a heart attack victim to paramedics while they simultaneously transmit a videodisk refresher course on cardiopulmonary resuscitation to you.

But will videophones or nationwide E-mail networks ever really catch on? It depends on ISDN, but ISDN depends to some extent on whether applications become popular.

Think of it as a highway that enables new cities to spring up. It is more than just a new switch or even a new network; it is a potential revolutionary force for the role of technology in society.

But the revolution requires demand as well as capacity. Fast new chips don't sell personal computers. The ability to process words, calculate finances, keep databases, and so forth sells personal computers. And as others have pointed out, no-one foresaw word processing when computers were invented.

Technology for technology's sake is almost never a success. The right applications may not be invented until after

ISDN has been around for a while, but the conversion to ISDN will be slow and piecemeal until the applications come about.

This situation leads to much ulceration in the telephone service and equipment businesses. The developing ISDN technology is well on the way to being implemented. Strategic commitments, the momentum of vast equipment purchases, and ever-increasing demands on the network will see that it continues. But fortunes will be made and lost over the details.

ISDN equipment and services will reach businesses first, and then probably residential users in islands of high-tech connectivity, such as new construction, and neighbourhoods that are near facilities being upgraded to serve businesses. While not exactly egalitarian, this approach makes economic sense.

A taste of the future?

Though the implementation of ISDN has just begun in earnest, standards committees have begun talking about its successor. A technology known as broadband ISDN will eventually provide individual subscribers with performance in the megabit range — enough for television-grade video and high- performance LANs. Adoption of a broadband ISDN could take place sometime in the 1990s. ISDN might suffice for many years; then again, it might merely whet customers' appetites.

Ben Bova once wrote an essay comparing the Douglas DC-2 with its successor, the DC-3. The DC-3 made air travel safe, reliable, and above all, profitable. The DC-2 did not have the necessary capabilities, but it gave Douglas Aircraft the technical expertise needed to develop the DC-3. It also gave the fledgling airlines an idea of what the next generation of equipment could do. The DC-2 was an enabling technology.

In all likelihood, the capabilities of the ISDN Basic- rate interface will be an embarrassment of riches to residential users. But not long ago, you could have said that about a microcomputer with 64k of memory. If it turns out that what the world wants is packet-switched voice or high-resolution video, ISDN will be a DC-2: merely a tantalising taste of the future.

Neither regular nor broadband ISDN will take off just because the technology is there. Technology vendors have seen the future, and, much to the chagrin of their planning departments, it consists of yet-unforeseen applications. ISDN is coming, but what shape it arrives in remains to be seen.

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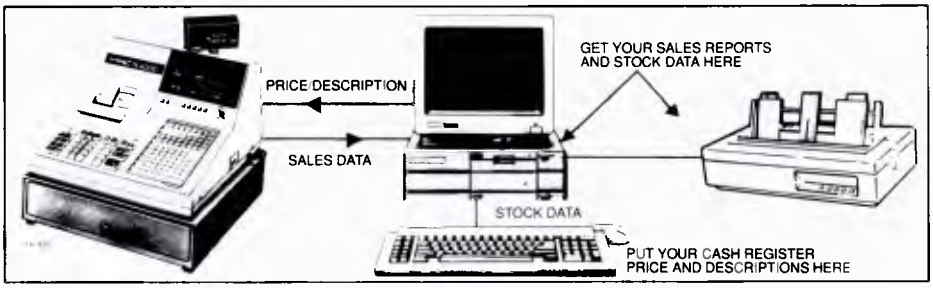
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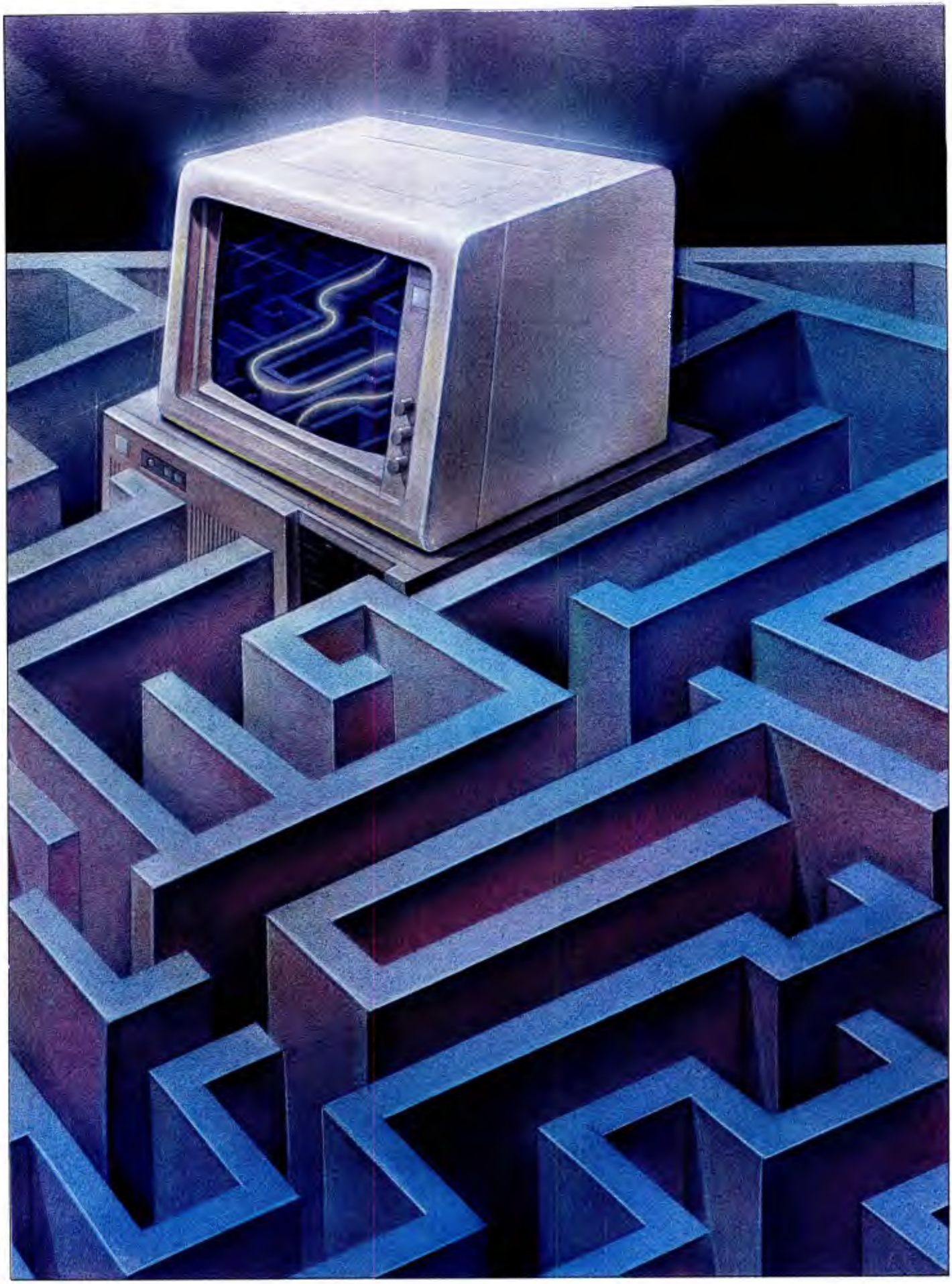


Emerald Bay

The recently-launched Emerald Bay database engine provides a consistent approach to data handling, and its accompanying package Eagle should interest developers. Kathy Lang cuts through the hype.

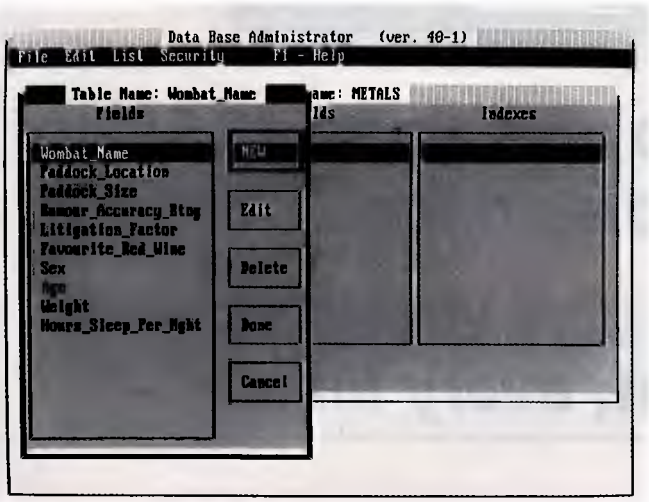
'If a man make a better mousetrap, the world will make a beaten path to his door.'

Emerson

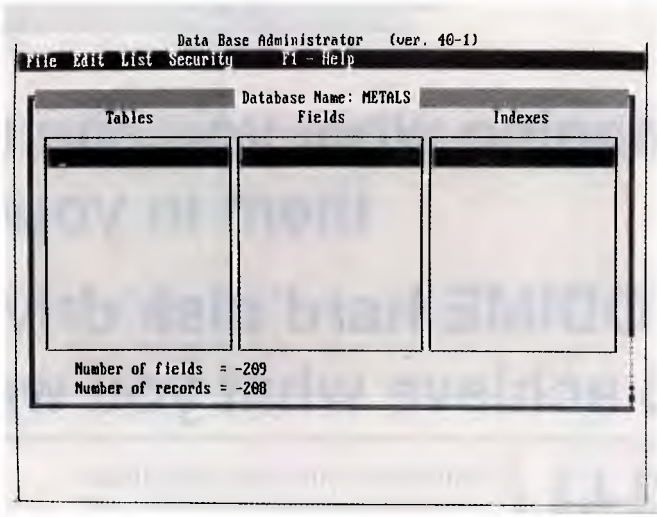
There is a sense in which dBASE is the mousetrap that its competitors try to beat: and none with more dedication than the original creator of dBASE, Wayne Ratliff, the architect of Emerald Bay and its accompanying database system, Eagle. The result is, despite all the hype surrounding the launch, a workman-like product with many similarities to dBASE III Plus, together with a few changes and enhancements which bring Eagle in the direction of dBASE IV. I hope you will be able to judge for yourself the efficacy of the resulting product. Because Eagle has so many similarities to dBASE, I have included a table summarising the comparable facilities of dBASE III Plus, dBASE IV and Eagle with Emerald Bay, and have used such comparisons extensively in the review.

Emerald Bay is in fact a family of products. The basis is what is described as a database engine, which resides in memory while any Emerald Bay application is being run and acts as a provider of data for Emerald Bay applications. Apart from the need to load Emerald Bay before you do anything, this should have no effect on single-user operations. It is intended to speed up and make more secure the sharing of data over a network, although it may make life more coherent in single-user systems too. When used in multi-user mode, Emerald Bay applications are fed data by the database engine, much as dBASE IV can be used with the Sybase SQL server to ease data sharing on a network.

Like the SQL server, the Emerald Bay database engine must run on a dedicated database server, not on a file server shared with other applications which do not rely on the Emerald Bay engine. The speed and security advantages are comparable with those for the SQL server. Probably the most significant is that, when a user requests a subset of information from the database, the database server selects the required records and ships only those over the network. In contrast, a conventional network would



Emerald Bay's operation is menu-based. It does not support a mouse and you need to press the first letter of the option you want or use the cursor keys to navigate through them



Selecting databases is also menu-based. Each database comprises very few actual DOS files which removes problems with DOS limitations on file handles

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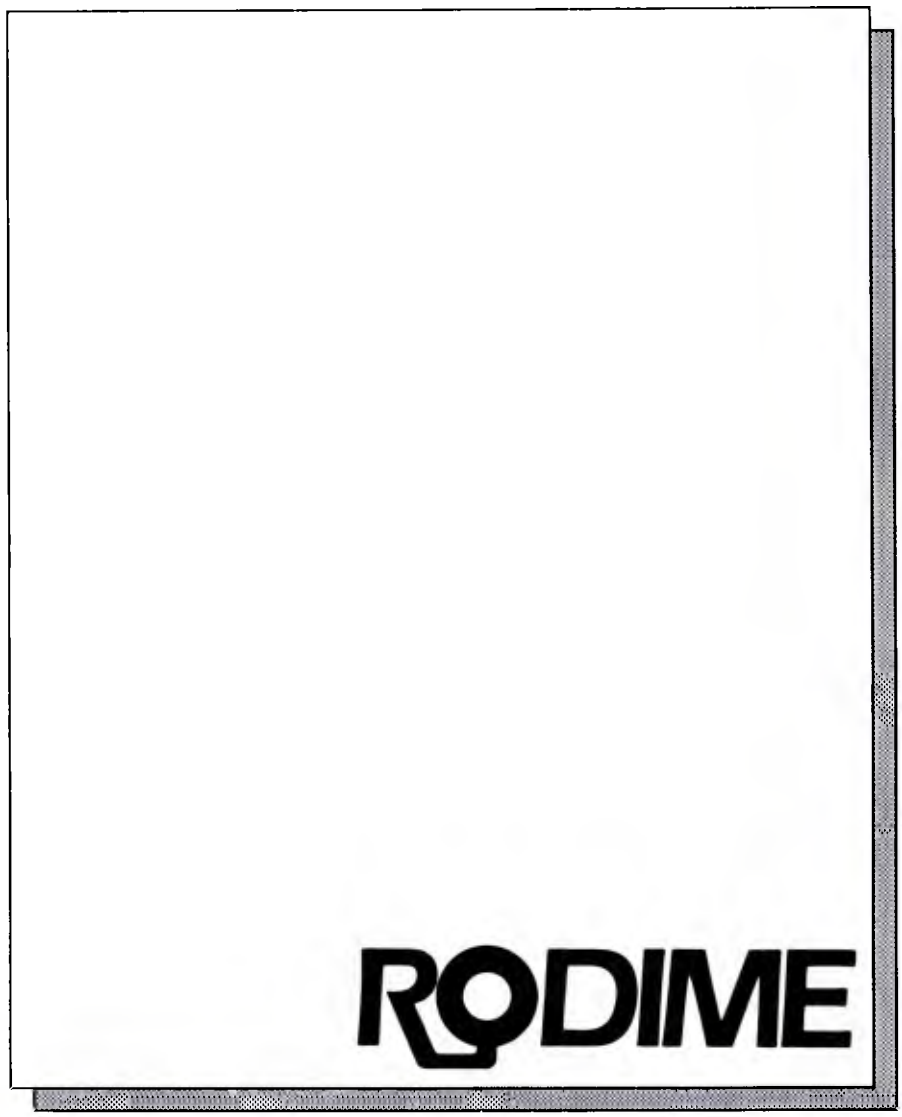

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General specifications

Feature	Package	Characteristics
Data types	dBASE III Plus	Number, date, logical, character, memo (512k). Data checks entirely DIY
	dBASE IV	Fixed, float, logical, character, date, memo (512k); two-dimensional arrays in memory; limited data checks
	Eagle	Fixed & float (several precisions), character, binary (two billion bytes), date, time, logical; one-dimensional arrays within records, 13-dimensional in memory; limited data checking
Files	dBASE III Plus	One data file per DOS file, one index per DOS file, DOS limits serious. Relational links very threadbare
	dBASE IV	One data file per DOS file, one DOS file for all indexes attached to a file, DOS limit less serious. Relational links little better, but ability to check them provided in command language
	Eagle	One DOS file per database of many tables, one DOS file per database for indexes, DOS limit largely irrelevant. Relational links as dBASE III Plus, though multi-file references better handled
Screen & Report Design	dBASE III Plus	Paint-a-screen limited to one file per screen/report, so almost useless
	dBASE IV	Paint-a-screen powerful and highly interactive
	Eagle	Paint-a-screen in separate module called from DOS; calling from Eagle unclear
Application Generation	dBASE III Plus	Toy
	dBASE IV	Powerful: includes menu generation linking of associated files; should enable many users to avoid dBASE programming altogether
	Eagle	None
Developers' Features	dBASE III Plus	No compiler, limited debugging
	dBASE IV	Semi-compiler, better debugging, windows, templates, template language in Developers' Release
	Eagle	True compiler?
Multi-user Features	dBASE III Plus	Explicit locking using networks conventionally
	dBASE IV	Implicit locking using networks conventionally, or through dedicated data server
	Eagle	Implicit locking using dedicated data server
SQL interface	dBASE III Plus	No
	dBASE IV	Yes
	Eagle	Promised
Availability	dBASE III Plus	Now
	dBASE IV	November 1988?
	Eagle	September 1988?
Price	dBASE III Plus	$1225
	dBASE IV	Not available as yet
	Eagle	Not available as yet

have to transport the whole database to the user's PC.

When using Emerald Bay, however, the database server approach is the *only* way in which data sharing may be achieved; you cannot use a conventional file server even if you are prepared to accept the drawbacks. On the other hand, Emerald Bay is here now; dBASE IV won't be available in Australia until the end of the year.

The Emerald Bay database engine provides the means by which databases may be defined and access to them controlled. These facilities should be available to a variety of applications, not just to database systems, still less only to Eagle. Indeed, in the initial batch of products is a C library and Summit, an add-on for Lotus 1-2-3.

The aim is to separate the specification of sets of data from their processing, in order to provide common data sets for a variety of applications. These would include not only conventional databases, but every kind of structured data, including much which would now be handled in spreadsheets.

The stated aim of this approach is to improve data integrity, and reduce the time needed to develop applications because they can rely on the existence of previously defined databases. It is not a new idea: much effort has gone into such approaches on minis and mainframes, with some measure of success in terms of data integrity, though productivity gains are much less often achieved. But there is a price to be paid in flexibility, and in the ability to produce be-spoke solutions fast. To anyone who has suffered with large companies in their attempts to speed up program development on their mainframe systems, the idea that increased centralisation improves application development time will seem distinctly bizarre.

So much for the concepts. How does this approach work out in practice, and what does it mean for the database user?

Setting up a database

The core components of Emerald Bay comprise a database definition module called DBA, a forms design module, a report generator, and an import/export utility. Data definition for Eagle databases would normally be achieved with the DBA module, though it is also possible to create a database, using the same specifications, within Eagle itself.

Emerald Bay databases can comprise up to 1000 sets of records (known as tables) because each database is stored

in a single DOS file. Indexes may comprise multiple fields, though they must be complete, not substrings; again, one file is used for all the indexes in a database, giving up to 1000 indexes per table with a total of 1000 per database, and all indexes are automatically kept up-to-date. The package is thus no longer subject to the DOS limit on individual data files and indexes.

The process of data definition using DBA is shown in the accompanying screenshots. Notice the absence of any ability to relate files together explicitly during file creation. There is a table nestling deep within the Emerald Bay engine which relates files.

At the moment you can only get to this via C or assembler. Many types of fields are available, but the facilities for handling large text fields (greater than 512 characters) are virtually non-existent. You can have up to 4000 fields per table and up to 16,000 characters in a record. Data is stored without trailing blanks — field length determines the maximum storage needed, not a fixed amount.

Data entry & updating

When a database has been set up, you can define forms for use in data entry and reports with which to see the results. The data entry form design module is quite powerful in itself, with the one exception that I could not find out how to relate fields from different files in the same form.

Data can be entered into these forms from the keyboard, using a simple program which displays blank copies of the form. The program does not permit access to existing records in order to update them. Records entered through this form program can be accessed in Eagle. The advertisements say that you also can access the forms in Eagle, but the manual is remarkably coy about how to do so. (My search for this and much other information was not helped by the absence of an index.) In addition, Eagle provides the interactive commands EDIT and BROWSE, very similar to ..SAY for specifying screen coordinates during data entry and display.

Reporting

Within Emerald Bay, there is an extremely powerful report generator. This allows you to specify the layout of the report, to extract selections of records, and to report on several tables from the same database. Again, these reports are said to be callable within Eagle, but I could not find out how to do it.

In use

The core modules of Emerald Bay provide the now usual range of helpful tools for ordinary users, such as pull-down menus, overlapping windows and full-screen dialogues. The original Ashton-Tate antipathy to mice must presumably be laid at Mr Ratliff's door, since the rodents don't work with any element of Emerald Bay, and no mention of them appears in the manuals (as far as I could tell from my readings and from checking the index in the *Core Components* manual).

Personally, I find WIMPS without the M very unsatisfactory, and to be told frequently (by the Emerald Bay manual) that the user image relies heavily on that of Microsoft Windows, just adds insult to injury, especially if you normally use Microsoft Mice!

Within Eagle, we are back to an older era. You know you're in for nostalgia when you read a reference in the manual to 'the currently popular light-bar menus', especially when it's followed by an example ..PROMPT that provides such things for real users, but which actually consists entirely of ..SAY statements. Eagle does not, however, use a dot prompt: it uses two —- a colon. It is driven entirely by commands — no equivalent ASSIST here. (Personally, I like commands, but I imagine that Eagle will come in for as much stick on this count as did early versions of dBASE.) Commands may be typed in at the keyboard, or complete programs entered through any text editor. Emerald Bay's own may be accessed within Eagle.

Eagle is thus very much a developer's package: not just for its colon prompt, but also for the provision of a direct interface to C and Assembler routines, well-designed security procedures such as Transaction Commit, and above all the royalty provisions. The basic Eagle is an interpreter. A compiler is advertised as being part of the Eagle armory, but there did not seem to be a compiler on my disks, and the relevant section was missing from my manual. Apparently the compiler is sent when Migent receives your registration card — a good way to ensure that users return their cards!

When it does come, it appears that compiled Eagle programs, and the Emerald Bay database engine needed to run them, can be distributed without royalty payment to Migent. In addition, the core components, notably the report generator, may also be distributed royalty-free. This will be a great carrot for developers who want to give their customers a tool for generating customised reports, for the (usually many) requirements that the users did not envisage at the start, and for which they are rarely prepared to pay an economic rate.

Documentation

As usual, the manuals are not what they might be. There is very little overall picture of what Emerald Bay is all about, and no tutorial material of any kind for Eagle. This may have been appropriate if the language had been designed entirely for developers, but the absence of an index to the Eagle manual is not.

Conclusion

Few new products have reached us with as much hype as Emerald Bay, and that, in computing, is saying something. The approach is interesting in that the separation of data definition from application program processing should make it easier to ensure data integrity, and reduce the burden on application programmers who need to handle the same data several times in different ways.

I remain sceptical about the likelihood of achieving the latter benefit. Mainframe programmers have been trying to do this for years, and their main achievement has been a lengthening of specification times, thus increasing the already very strong chance that the end result will be nothing like what the user really wanted. 'Quick and dirty' may not be very elegant, but often it's the only way to achieve usable results.

Throw away the hype, then, and what have you got? Emerald Bay is an attempt to provide a consistent approach to data handling, which is reasonably successful as far as it goes in the first release. The features of Eagle will not excite ordinary users much, but the developers at whom it is aimed should find plenty to interest them. All in all, if you use the same mousetrap designer twice, you must expect to get more — and perhaps better — of the same design the second time around. It is interesting that, while dBASE IV does include many improvements for developers, the greatest steps forward have been made in putting off the point at which a user needs to become his or her own developer. Eagle assumes that point to be square one.

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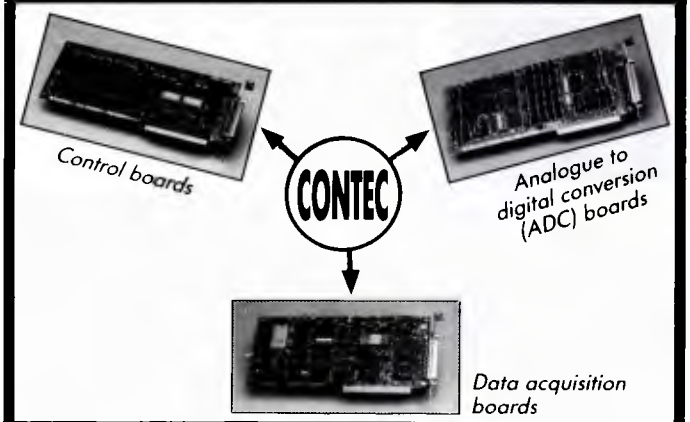

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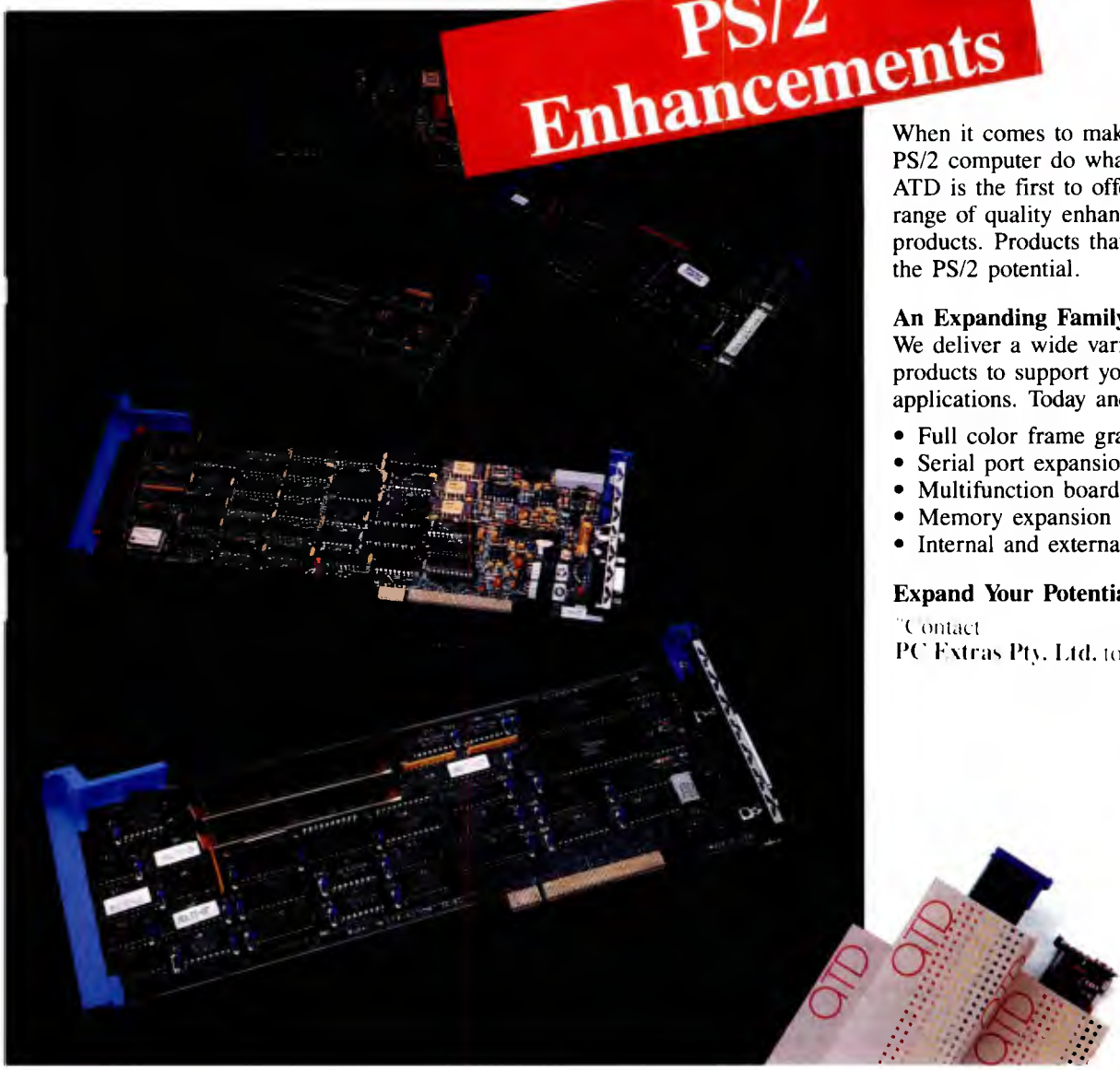

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PageMaker 3.0

Aldus has upgraded its popular DTP package to the satisfaction — the company hopes — of its wide user base. What improvements have been made, and how does the new PageMaker compare with its close rival, Ventura? Henry Budgett finds out.

Ever since the beginning of the 'desktop publishing revolution' there have been two quite separate schools of thought about the way in which such packages should operate. The first school believes that any document can be broken down into a series of discrete specifications which then can be used to automate the production process by embedding encapsulated versions, often called tags, within the source material. When these tags reach the publishing package they assume the correct typeface, size, style and other typographic characteristics. In some cases these tags will control the page layout as well — the number of columns, the size of the margins, and so on. A typical example of such a package would be Xerox Ventura.

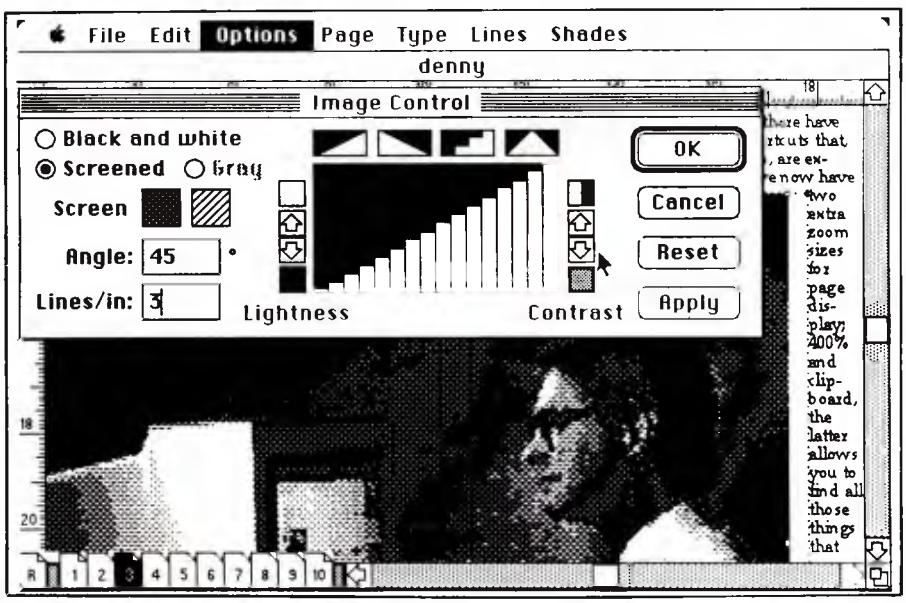
The other school believes that the additional skills of the paste-up artist should be retained rather than sacrificed on the altar of automation. They have, after all, several centuries of estabiished methodology behind them, as virtually all the documents created until recently were indeed all hand assembled. Where the system falls down, of course, is when someone changes their mind about the typeface that's going to be used or the number of columns per page. With an automatic system, a few simple alterations to the style sheet and it's all done for you. With a manual system such as PageMaker, the leading exponent of this method, it is, quite literally, back to the drawing board.

During the first two years of desktop publishing, much argument raged about which is the better system. Ventura has been criticised for taking away the exquisite and interactive control, while PageMaker has been similarly slated for its tedious approach to standard formats and layouts. Both products have gone through minor cosmetic revisions; PageMaker migrated onto the PC from the Macintosh at its third release while Ventura tidied up numerous loose ends with version 1.1. Nothing particularly dramatic, just good, sensible enhancement.

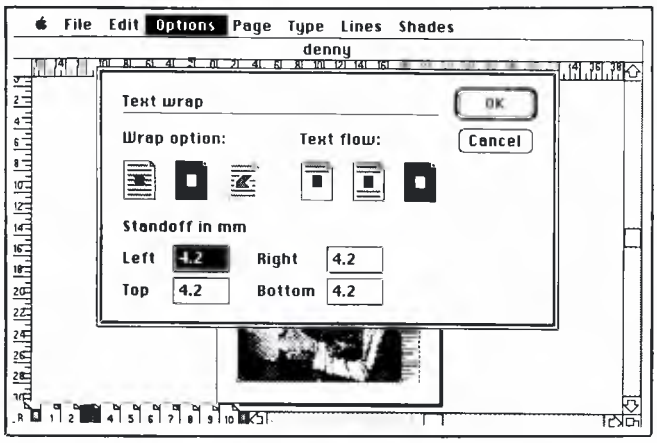
All that changed, or so Aldus would have us believe, with the launch of Version 3.0 of PageMaker. Available now on the Macintosh and the PC, it represents a major upgrade from previous releases and attempts to satisfy many of the demands made by its users — Aldus claims an installed base of around 150,000 worldwide. Because much of the product will already be familiar to readers, this review will concentrate, as far as is possible, on the upgrades and the reasons behind them rather that the existing features.

Overview

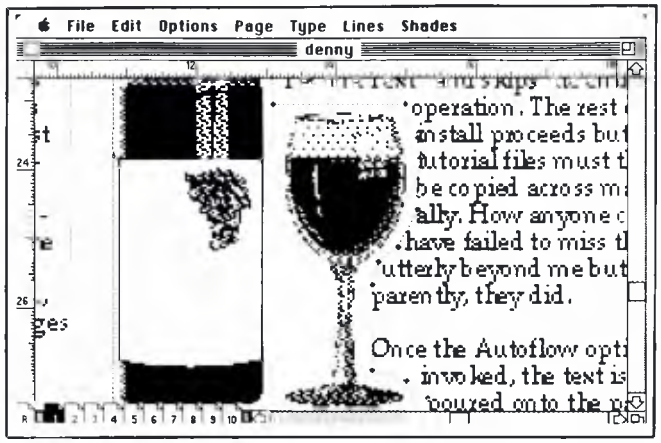
The new release of PageMaker has addressed itself to four main areas in which users felt the product was lacking: long documents, repetitive formats, graphics and colour, as well as adding additional



One of PageMaker's strengths is its ability to process scanned images in quite sophisticated ways



There are a number of options for how text should flow around inserted images. Text can flow around or behind an image and can fit the ragged edges of a graphic



PageMaker can flow text quite accurately around an irregular shape. User control of the boundaries makes use of 'knobs' to manipulate their shape

features such as text export and enhanced file import facilities. The relative worth of each of these is dependent upon both the user's aspirations and the sort of document that he or she is going to produce. A classic example of wasted power is found in Ventura's ability to generate an index automatically; a classic power feature, often touted by its supporters, that will be used by a mere handful of people. Aldus has had to carefully avoid building-in power features which would, for the average user, totally unbalance the product.

Probably the single most-raised criticism of PageMaker in its earlier versions was that it did not automatically flow text from column to column or page to page. Aldus' standard reply was that no paste-up artist did it automatically; but, with Version 3.0, the company has succumbed to the demands and Autoflow is an option when text files are being imported. This and all the traditional 'power features' of 3.0 must be selected by the user — they are not default options when you install the package.

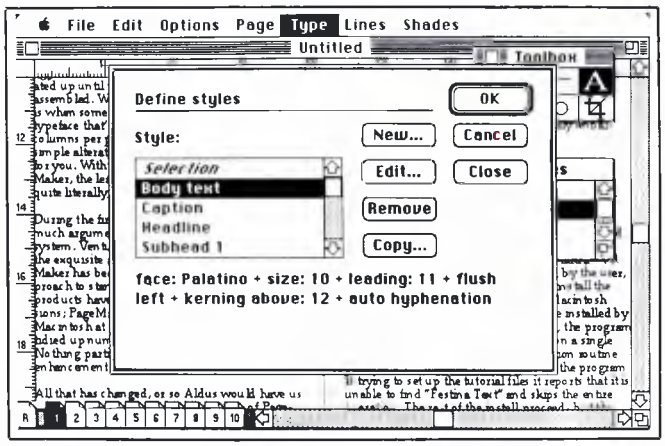
PageMaker 3.0, by the way, is the first Macintosh package I have met which has to be installed by a loader program. The reason is simple: the program is now bigger than 800k and won't fit on a single disk!

When the Autoflow option is invoked, the text is poured onto the page and flows from column to column until the page is full. At this point, a new blank page is generated according to the layout defined on the corresponding master page and the text then flows into that, and so on. The text flow can be interrupted at any time by clicking the mouse, or the flow method can be altered to semi-automatic or back to manual by clicking in conjunction with Command or Shift keys. Semi-automatic completes the current column and then pauses with the text icon still on the screen, while manual completes the column and stops.

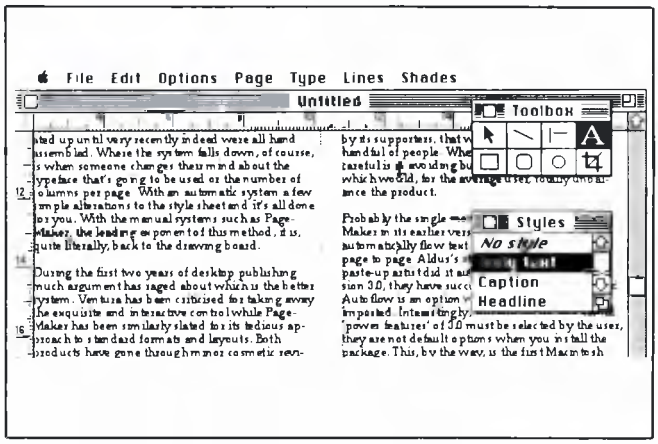
The speed of flow is impressive — far faster than any human could achieve, either with traditional methods or using earlier versions of PageMaker — and so the feature is a worthwhile addition to the product. The fact that direct competitors such as Ready, Set, Go! and XPress already have it is now of historical rather than current interest.

Tagging

The second area in which Aldus has im-



One of the new features is the inclusion of style sheets as is now common on many other DTP packages. The summary is a useful way of remembering what each style looks like



This menu displays the name of the style sheet in force at the cursor. Changing to a new style involves highlighting a block of text and clicking the new style

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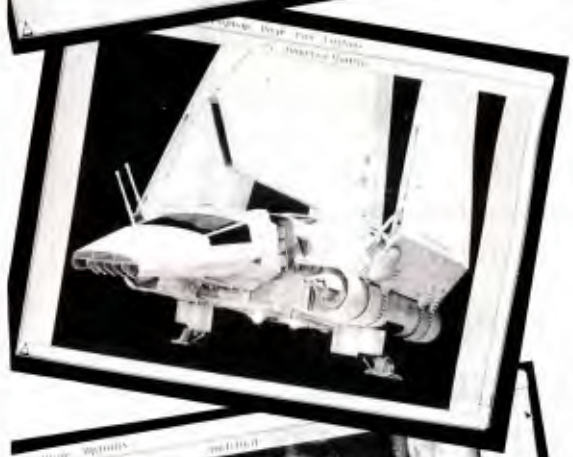

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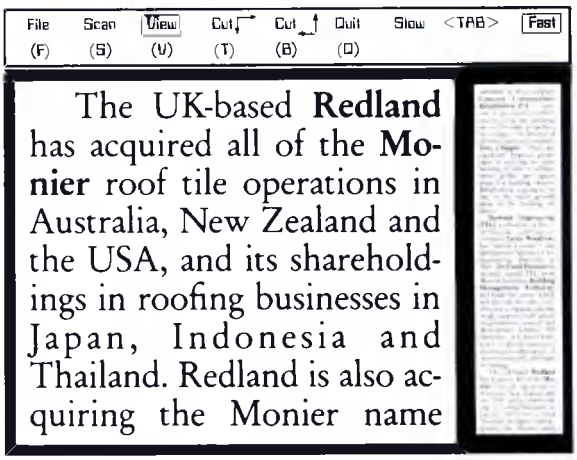
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proved the handling of long documents is in the implementation of style sheets. These are created in conjunction with a skeleton layout for whatever document you wish to produce, and consist of a number of tags. For example, the Heading tag might be defined as Times Roman 24pt on 26pt Bold Centred Unjustified. Additional items such as colour, indentation and tabs also can be attached to the tag. A collection of these tags makes up a style sheet and, together with the skeleton document, are saved as a template.

There are two ways of using the tagging system. The simplest, but least efficient, is to load raw ASCII text into the template and go through the document highlighting the text areas and applying the tag. While this is fine for short items, it misses out the real benefits of style sheets. To make best use of them, the tag names are embedded into the text file which is then placed into the template. Now the tags automatically adopt the defined styles.

There are two points worth noting: the default setting is not to read tags; and, so far, it seems that you cannot mix tags within a paragraph. The style sheet system used by Microsoft Word is fully supported by PageMaker 3.0, within the limits of both programs, so fully-styled word processor files can be imported and will reproduce accordingly.

When the tagged text has been placed, it is possible to alter the tag's definition in the style sheet and have all the occurrences of that tag change. There are, however, limits to the amount that can be achieved. There is no implementation of a line, column or page-breaking tag so there is almost inevitably additional manual kerning to be done. Nor is there any capability to automatically add simple graphic elements such as a reversal block, a box or even a rule, to elements of text.

While Ventura's tags support all these features and more, those provided with Version 3.0 of PageMaker are simpler and, as a direct result, are likely to get more use. From a practical point of view, the introduction of tags saved half a day on the production of a 24-page newsletter compared to using the previous version of PageMaker.

Output

One incidental problem often faced with PageMaker is that most of the final editing is done 'on the page'. This means that the original word processor text file lags behind the alterations. Macintosh PageMaker supports text export from Version 2.0 but this has now been added to the PC version for 3.0. The output formats supported by the standard Version 3.0 package are Microsoft Word, WriteNow and ASCII on the Macintosh, and Word 4.0, DCA and ASCII on the PC. In the case of Word on both systems, the export includes such portions of the style sheet as are supported by the word processor. Additional support for PC-based packages is provided by the Macintosh version — WordPerfect, WordStar, XyWrite and DCA — while both versions support a system of installable filters for both import and export.

As well as co-operating with software houses, Aldus will be introducing a range of filters together with a programmer's kit that allows special versions to be generated by the user — given that he or she can write programs in C.

Aldus has added extra support for non-PostScript printers such as those which offer PCL support. As well as a soft-font installer utility, PageMaker 3.0 for the PC now comes with the basic Bitstream font library as standard. This consists of the font compiler, Fontware, and three outlines — Dutch, Swiss and Courier (the first two are better known as Times and Helvetica).

The outlines are scaled to produce bitmapped fonts at the required sizes. Fontware produces type at up to 128-

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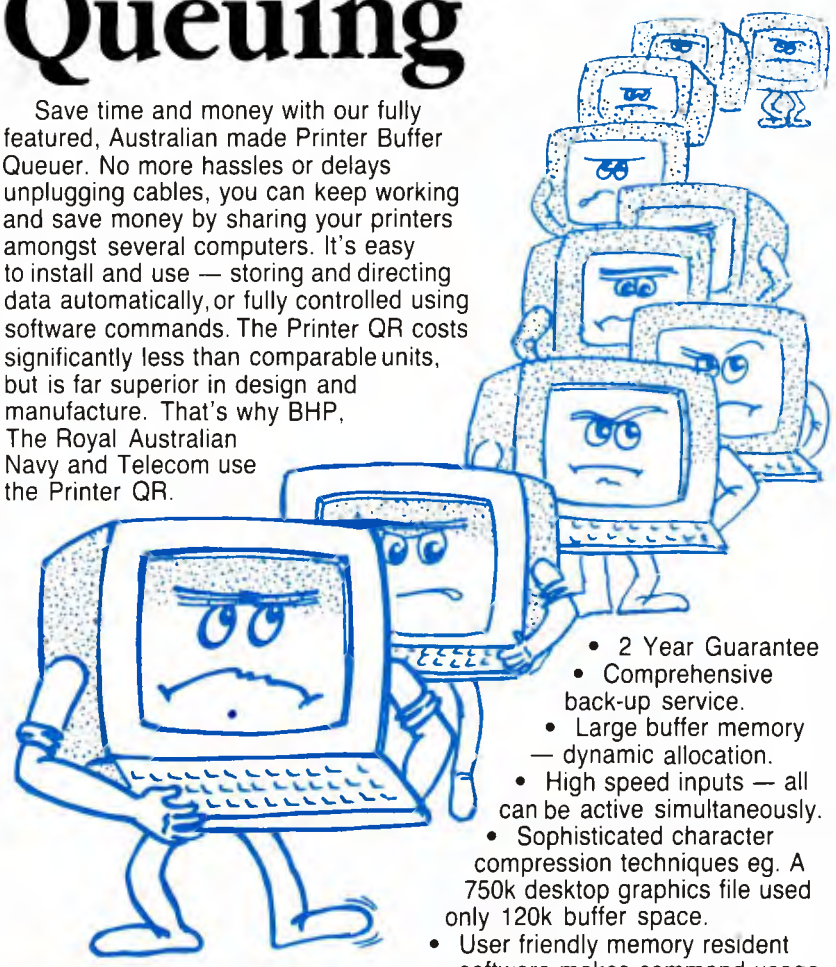

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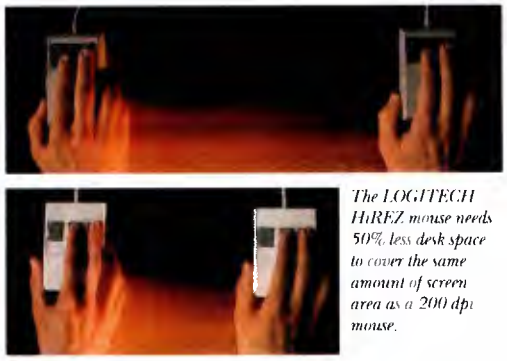

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Ventura versus PageMaker

Many claims have been made by observers of the desktop publishing market that PageMaker 3.0 was going to be Aldus' answer to Ventura. In the event, the Ventura users are probably wondering what all the fuss is about. On the most trivial of levels, it could be claimed that Version 3.0 has caught up with Ventura because it supports style sheets and graphics wrap-around. Certainly, both products now have these features, but that doesn't necessarily make them any more similar.

Ventura is, and will probably always be, document-oriented. That means that it knows about things like sections and chapters, tables of contents, indexes, and anchored text and graphics. Features like embedded lines and boxes within tags, section and chapter numbering, and the constant update of source text files, are absolute requirements for such a product. What this means, of course, is that the user gives up a certain amount of control over the layout and the actual construction of the document. For simple, repetitive styles such as memos, proposals, price lists and books, this is a small price to pay given that productivity is improved. It also demands that someone is skilled enough to set up the style sheets in the first place, unless you want to stick with the standard set provided by Xerox.

PageMaker, on the other hand, is still page-oriented. That's not to say that it cannot create long documents — far from it; it's just that equal emphasis is given to each page by the program. The user is still firmly in control of what goes where at every stage of the document's creation and the program has lost none of that intuitive feel. The changes that have been made simply automate the paste-up process to a greater degree: even the style sheet/tagging system is unobtrusive and operates in exactly the same way that a traditional art studio would expect.

Anyone who has had any experience at all of dealing with typeset material or the creation of pages should still find PageMaker the more logical choice, whatever the document. People who need the automated processing of Ventura will still need it, over and above any of the new facilities incorporated in PageMaker Version 3.0. The upgrade hasn't changed the relative positioning of the two products at all — it has merely expanded the range of documents for which users might consider PageMaker suitable. Certainly, my use of PageMaker will now increase, although at the expense of products such as Ready, Set, Go! rather than Ventura.

point, together with matched screen fonts. The fonts are claimed to match exactly the standard Adobe ones, which means that proofing could be done on a low-cost PCL printer with typeset output produced on a Linotronic. This trick will only work if the spacing values for the fonts, the metrics, match exactly; in Bitstream's case, they do.

Graphics

The third area in which major improvements have been made to PageMaker is in its ability to handle graphics. While running text round graphics has always been possible, although labour intensive, Version 3.0 provides one of the neatest systems yet implemented on any package. When a graphics element is placed on a page, there is now an option to set text wraparound. As with all the new enhancements this is not the default — it must be selected. The text can jump over the graphic, flow round it as a regular shape, or, under user control, flow around irregular objects.

The latter option is obviously the interesting one, and it uses a very different method to competitive programs. When a graphic is placed it has eight handles positioned at the corners and centres of each side for re-sizing and general manipulation. If regular flow has been selected, the user has the option of setting the amount of stand-off between the graphic and the text. This puts a second frame round the graphics, spaced away from the handles by the desired amount. This frame can be manipulated to make it into an irregular shape to match the text to the graphic.

Additional handles can be added to the second frame simply by clicking on it with the mouse These are then dragged to re-shape the boundary. For a complicated shape this may take a few minutes, but it is much more controlled than some of the automatic methods. As a user tip, it is worth doing this manually for each page otherwise the text is continually trying to re-format itself.

Further improvements in graphics handling include the ability to manipulate both TIFF and paint images after they have been placed in a publication. While the facilities are simple — they're certainly not trying to compete with Letraset's ImageStudio — they are enough to get you out of a hole. The basic controls offered are the ability to adjust the lightness and contrast levels, add either a dot or line grid, and adjust the screen angle. While the output from a LaserWriter or similar PostScript page printer is barely acceptable, the image control facility is extremely useful if you are going to a Linotronic typesetter for final output.

The main addition for graphics in PageMaker 3.0, though, is in the area of colour support. Just as a style sheet is set up for text, so it is possible to create a basic colour palette using either the HLS (Hue, Lightness, Saturation), CMYB (Cyan, Magenta, Yellow, Black) or RGB (Red, Blue, Green) models. When the required colour has been mixed it is stored in the palette for use at any time. Any area of text, a graphic, lines or areas of tint can then be coloured. Obviously, the best visualisation will be achieved with a colour monitor but this is not essential.

The bonus of working this way is that when the document is printed, colour separations are automatically created which can be used to make printing plates. On a 300 dpi page printer, spot colour separation — solid colour — is possible, but to get the best results for full-colour work, a typesetter is required. Colour proofing can be done on the QMS ColourScript PostScript printer or the HP PaintJet which is supported by the PC version through Windows.

Changes

While these are major upgrades to PageMaker, there are numerous smaller changes which make it easier to use. There are also, sadly, some which are not so beneficial. On the PC version, which now runs under Windows 2.03 or Windows/386, there have been some changes to the keyboard shortcuts that, for anyone used to the previous version, are quite strange.

On the positive side, there are two extra zoom sizes for page display — 400 per cent and clipboard; the latter allows you to find all those things that you hid on the clipboard and forgot about. Also provided, and not before time, are independent horizontal and vertical rules, which means that keeping track of the number of lines of copy on a page is extremely easy. You simply set the vertical ruler scale to be the same as the leading.

While these are small adjustments, Aldus has changed its tack on two other fronts as well. Previously — that is, pre-Version 3.0 — there were two sets of predefined pages or templates sold under the Portfolio banner. Version 3.0 comes with 19 templates as standard, which is a very nice touch. These are in addition to

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the normal tutorial files supplied, and it is in the area of training that the seconc change has been made. Last year Aldus released a training system called PageMaker Classroom which consisted of a video, a doctored working version of PageMaker, course material and a load of other goodies. This year's offering is called PageMaker College and comprises an extended version of the video, a ten-site-licensed copy of PageMaker (doctored, of course), all the training materials, workbooks, and so on.

Conclusion

Overall, PageMaker 3.0 is a substantial improvement on its previous versions and, unlike many upgrades, it has kept firmly to its original concepts. None of the new features take away control from the user or make the program harder or more complex to use, a strategy which some other vendors would do well to emulate.

Indeed, at first sight, the current user might wonder where the additional features actually are, so closely has Aldus stuck to the previous version's user interface.

The only real grumbles are that the tagging system doesn't go far enough — a column and page-breaking tag is *essential:* and that the keyboard shortcuts for the PC version seem to have been changed from the earlier version. Of course, there are things that I would have liked to have seen, such as multi-chapter documents and greater typeface and leading control, but then there wouldn't have been anything left to put into Version 4.0, would there!

END

PageMaker 3.0 costs $1998 for the PC and $1498 for the Mac, and is available from InfoMagic, tel: (02) 975 1044.

The UK version is the international package sold in Australia.

The differences between the UK and US versions are subtle. Obviously the spelling of words such as 'color' has been corrected, both onscreen and in the manual, but other changes such as default paper sizes and hyphenation dictionaries have also been modified.

Aldus Europe has set up a multi-lingual production facility to create all the European language editions of its products.

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If the face fits, print it

Closer attention to the size and style of the type on your printed output could be to your professional advantage — it depends largely on the fonts you choose. Kathy Lang puts print into perspective.

When you use a daisywheel printer to produce a document, typographical sophistication is pretty well out of the question. Your freedom of action is limited to choosing between 10 pitch and 12 pitch, using one of a very restricted set of typefaces such as Courier and Prestige Elite. To handle more complex situations, for example the production of mathematical equations, is a difficult and time-consuming exercise which involves changing daisywheels.

Laser printers have, of course, changed all that. Because the characters are formed electronically, the range of characters and the styles in which they may be portrayed can be varied without physical intervention. This change has brought the office computer user into contact with another world of history, experience and terminology: that of printing. While no-one using a PC for word processing and basic desktop publishing needs to become an expert in traditional printing terminology and skills, some understanding of that world, and of what goes on under the bonnet of your printer, can help you to produce better documents. Here we explore a part of that world, the font.

Definition

These barnacles of history and of conflicting cultures give us a problem right from the start: there is no general common usage of the word font. A typeface defines the design of a set of characters; our old friend Courier is a typeface, as are the publishing workhorses Times and Helvetica. A font is the realisation of a typeface in practical terms, which may vary slightly between different physical devices.

Some people use the word font to refer to the complete set of all styles, sizes and weights of the same typeface, while others regard each combination of style and weight (Bold, Italic, Bold Italic, and so on) as one font, with the set being called a font family. Printer salesmen tend to call each combination of style, weight and size a font, since it allows them to maximise the numbers they can quote on their sales literature.

Here, I use the most comprehensive definition, in which a font comprises all the styles, weights and sizes of one typeface.

'While the freedom to choose your own layout has some great attractions, it can go to your head and give your readers eye-strain.'

The basic element in each font is a character: the main aspects of a character are shown in Fig 1. The characters use the Palatino typeface; of the elements labelled, only the serif is not universal. This is the fine line at the top and bottom of each character in each serif (or serifed) face, which is lacking in sans serif faces. By and large, serif faces are more readable for large amounts of running text, but are not as easy to print clearly in small point sizes and may appear rather fussy in very large point sizes.

When a character is printed, it must be separated from those on either side by some white space. On most daisywheel printers a mono-spaced font is used, in which each character takes up the same amount of space regardless of its physical width.

Some daisywheels, and all laser printers, use proportionally-spaced fonts in which each character occupies an amount of space suitable to its size — this means that the letter 'i' takes up less space than the letter 'm', for example.

The design of typefaces must allow for this variable: it is much harder to design a good-looking fixed-space font than one in which the letters are spaced proportionally.

However, the use of fonts designed to be proportionally spaced brings some complications. People who are used to typewriters and mono-spaced daisywheels tend to use spaces rather than tabs for tables, indenting, and other situations where fixed positioning of text is needed. Some word processors still

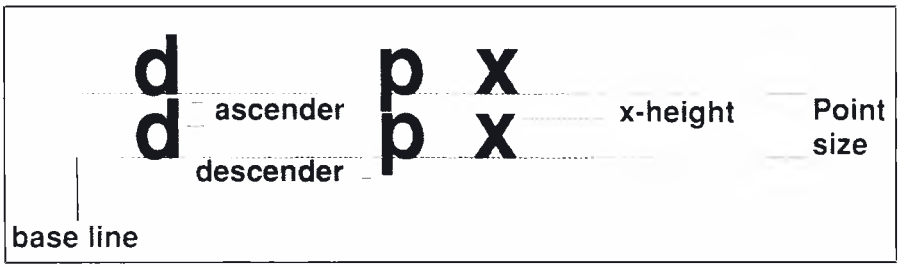

Fig 1 Character terminology: how different parts of letters are labelled and measured

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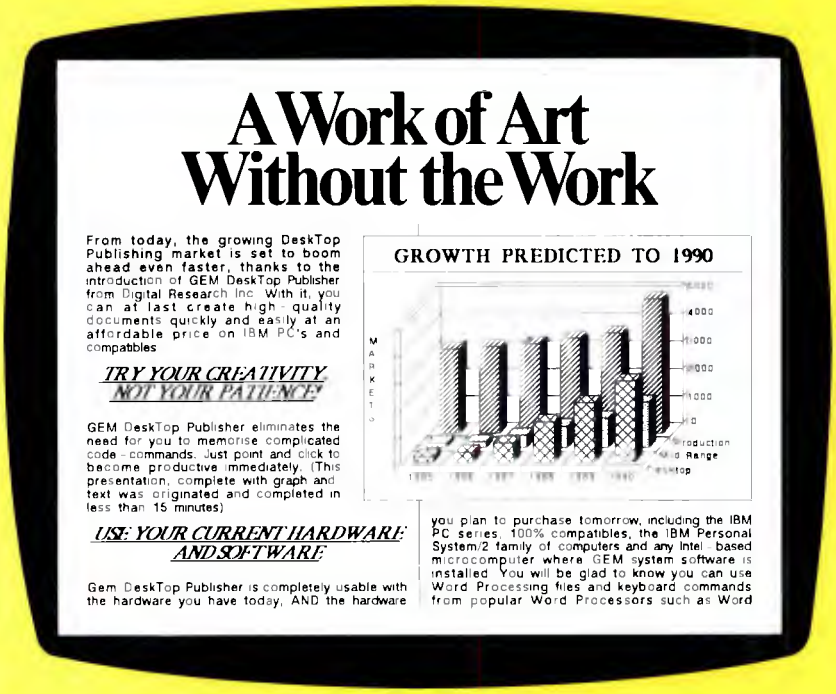
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translate presses of the tab key into spaces anyway. In either case, the results will look quite odd when printed in a proportionally-spaced font.

For while you can rely on all digits taking up the same amount of space (and the special figure space if the software provides one), no other characters will, so you are likely to end up with an uneven left edge to your columns.

Using a laser printer font will also give you access to more characters in each face. In addition to the restricted range of the basic character set, you should also have access to proper open and close quotes (single and double), the copyright and trademark symbols, foreign accented characters and mathematical symbols. Many printers also have a special symbol font full of oddball characters, which can be very useful in trying to catch people's attention when space is limited.

Another very noticeable difference is in measuring the size of the font. Typewriters measure character size in pitch, which is a measure of characters to the horizontal inch; 10-pitch type gives ten characters to the inch across the page, while 12-pitch gives 12 characters to each horizontal inch. Character size in proportionally-spaced text is traditionally measured in picas and points, where 72 points or six picas equal one inch. Most desktop publishing programs allow you to choose between using these measures and inches or centimetres. But, since the basic unit used by the typeface designers is the point, I have found it easier to learn this approach rather than constantly worrying about the relationship between some other measure and the points used by the font makers.

However, point size is a measure not of the horizontal width of a character but of the vertical height, from the base of one line to the base of the next when no extra vertical space is added (that is, when the ascenders of one line and the descenders of the line above abut one another). The width of the letter 'm' is approximately equal to the point size, but this is a very rough approximation. As a result, the same text printed in a variety of fonts of nominally equal point size will occupy a different line length in each. This point is illustrated in Fig 2, in which the same sentence is printed in the same point size in a range of fonts.

Spacing

The space allowed for each letter in a proportionally-spaced font makes no assumption about which characters each letter will abut. Where two letters with complementary shapes occur together, such as V and W, this can give the appearance of excessive white space. A good desktop publishing program will, at your request or by allowing you to intervene directly, move such pairs closer together, a process known as kerning. And where the overall letter positioning seems to be too loose or too tight — that is, with too much or too little white space around letters — you should be able to adjust this by loosening or tightening the tracking. Similar controls should apply to the spacing between words.

All these controls apply either equally to all words or letters, or discriminate by recognising that letters of different shapes need different treatment. Another possibility, when a line contains too much white space, is to use or permit variable letter spacing — that is, to vary inter-letter spacing arbitrarily to reduce space between words.

This method is rightly frowned on by most typographers, since it tends to make the text harder for the eye to read while it accommodates arbitrary spacings. If you cannot get the right effect by a combination of kerning, tracking and word-spacing adjustment, it is better either to use more hyphenation or to rewrite the text slightly to fit.

Significant differences also occur in the use of vertical space. On a word processor, you are usually limited to single, one-and-a-half and double-line spacing. Although the daisywheel itself is capable of finer adjustment, the computation required to get page lengths correct has until now, not been thought worthwhile in a word processor. (Microsoft Word has always been the exception, and now the other leading word processor suppliers are adding greater flexibility in this area.)

In typesetting and printing, however, vertical spacing is also reckoned in points. Running text will typically be set in 10 points with an extra two points' white space between each line; this two points of white space is often known as leading (pronounced "ledding") because in hot-metal typesetting, lead strips are inserted between each line to create this extra space.

The amount of vertical space needed to achieve an acceptable effect is proportional to the font size, and most desktop publishing programs will adjust spacing appropriately unless you prefer to set it explicitly yourself. But it also depends too on the kind of typeface: generally, fonts with more open characters, such as Palatino, can be set more closely than fonts such as Times in which the text already appears dense because the characters are relatively close together.

Fonts for printing

There are two methods of creating fonts for use on laser printers; both may involve fonts which reside in the printer or are downloaded from disk when needed. Simpler and cheaper printers, such as the Hewlett-Packard LaserJet series and its many clones, use bit-mapped fonts in which each size, style and weight of each font are stored explicitly as a pattern of dots. The amount of space taken up by font files is substantial, so the printer will be able to handle relatively few at one time, even if the fonts are downloaded from disk. Where fonts must

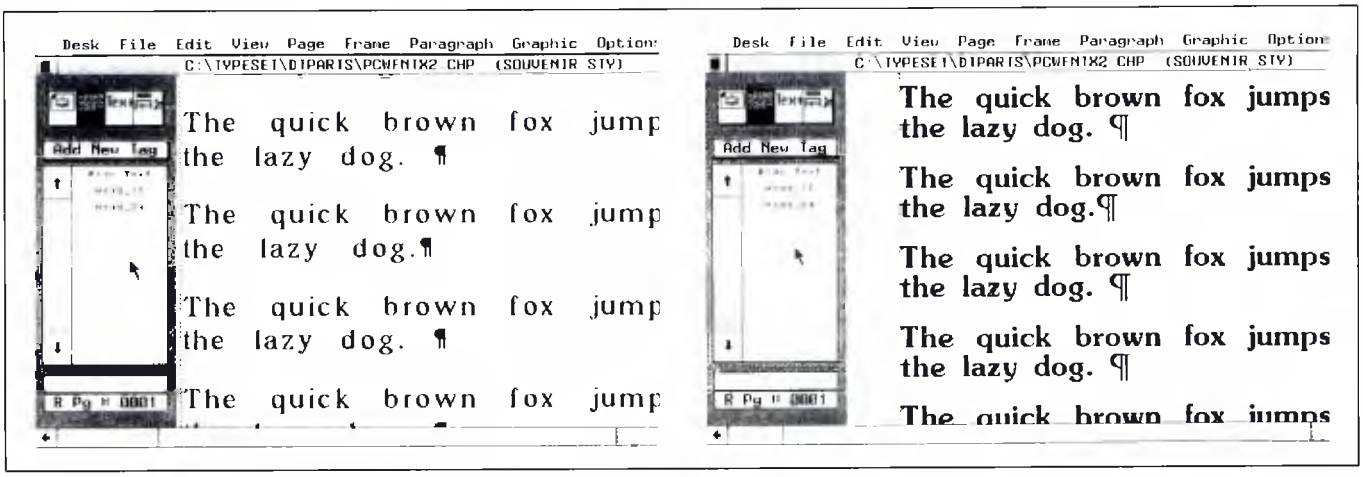
Sans Serifed Fonts

Standard sentence	Font	Comment
The quick brown fox jumps over the lazy dog.	Avant Garde	1970-designed font with contemporary geometric look often used to give an impression of modernity
The quick brown fox jumps over the lazy dog	Helvetica	The universal work-horse: reproduces well at small point sizes, boring in large quantities, so more suitable for headings and for directory entries than for running text
The quick brown fox jumps over the lazy dog.	Stone Sans	An Adobe font, specially designed for laser printers; very clear even at small sizes, so a good substitute for Helvetica. Semi-bold as well as bold: helpful for varying emphasis without over-mixing fonts

Serifed Fonts

Standard sentence	Font	Comment
The quick brown fox jumps over the lazy dog.	Bookman	A popular book face, more prosaic than Palatino, with rather thick uprights and serifs. These tend to give an impression of solidity, but a full page can look much too black, unless you use generous leading and plenty of white space between paragraphs and around figures
The quick brown fox jumps over the lazy dog.	Charter	Bitstream's serifed font specially designed for laser printers by Matthew Carter, a respected modern typographer. Comparable in application with Stone Serif.
The quick brown fox jumps over the lazy dog	Galliard	A modern adaptation of a 16th century design. Galliard is particularly good where elegance is needed – menus for our local restaurants, for instance, where the italic is especially useful. Personally I find it rather fussy in large quantities

Fig 2 Some common fonts and how they look in text, showing the difference in effect between serif and sans serif types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The quick brown fox jump the lazy dog. ¶
The quick brown fox jump the lazy dog.¶
The quick brown fox jump the lazy dog. ¶
The quick brown fox jump
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Add New Tag
The quick brown fox jumps the lazy dog. ¶
The quick brown fox jumps the lazy dog.¶
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The quick brown fox jumps the lazy dog. ¶
The quick brown fox jumps

Fig 3 Default face on screen (left) and specified face (right) spacing of the default face imitates that of the actual face

be permanently resident, or are stored on cards (rather like credit cards) which must be physically present when the printer is used, you are further restricted. Restrictions apply both to size and to the number of fonts; most LaserJet-emulating printers can, for example, print no larger than 36-point text.

Such approaches are usually adequate for office publishing where your needs are primarily for better looking and quieter word processing, although even here you may find the size restrictions a problem when creating display material such as transparencies for overhead projectors. A more sophisticated approach is to use a printer which is driven by a page description language, of which the most widely available is PostScript.

All printers, even basic dot matrix machines, need some kind of instruction language to drive them. However, most printer 'languages' are simply sets of escape sequences which drive the physical mechanisms, such as form feed, and pass over streams of bits to be interpreted as dots by the printer. A page description language is capable of much more. PostScript does not require each

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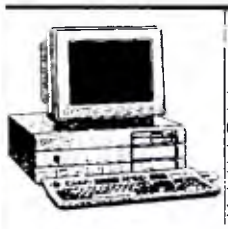

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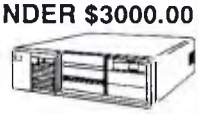

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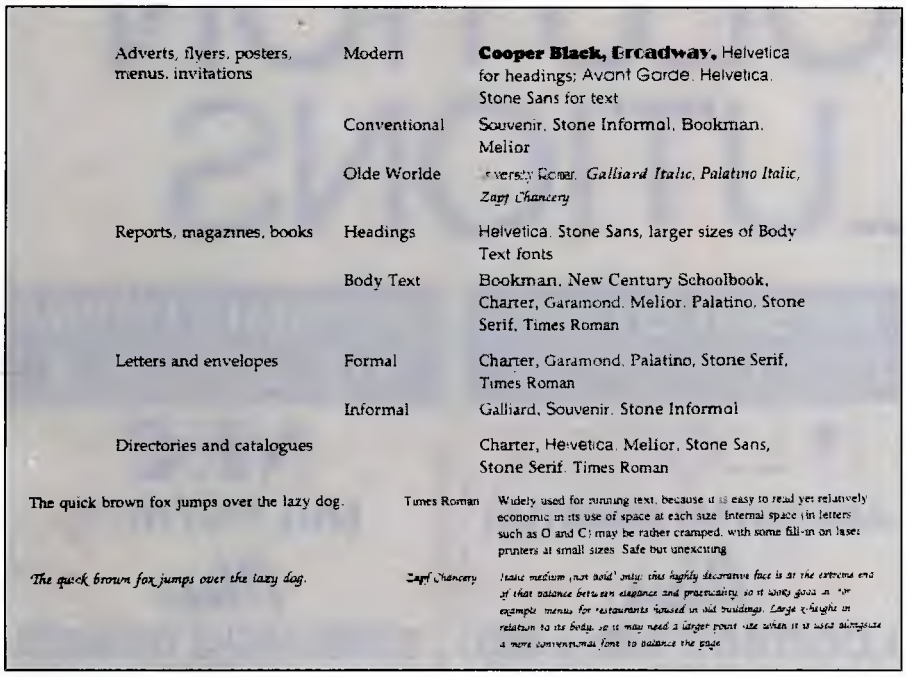
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Helvetica, Stone Sans, larger sizes of Body Text fonts
Body Text
Bookman, New Century Schoolbook, Charter, Garamond, Melior, Palatino, Stone Serif, Times Roman
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Informal
Galliard, Souvenir, Stone Informal
Directories and catalogues
Charter, Helvetica, Melior, Stone Sans, Stone Serif, Times Roman
The quick brown fox jumps over the lazy dog.
Times Roman
Widely used for running text, because it is easy to read yet relatively economic in its use of space at each size. Internal space (in letters such as O and C) may be rather cramped, with some fill-in on laser printers at small sizes. Safe but unexciting
The quick brown fox jumps over the lazy dog.
Zapf Chancery
Italic medium (not bold) only; this highly decorative face is at the extreme end of that balance between elegance and practicality, so it looks good in "for example" menus for restaurants housed in old buildings. Large x-height in relation to its body, so it may need a larger point size when it is used alongside a more conventional font to balance the page

Fig 4 Fonts for particular purposes: how the character of a typeface can be matched to the 'mood' of a document

size, weight and style of font to be available before the document is printed; it creates each example it needs from an outline of the font by scaling it to the appropriate manifestation.

This approach has significant advantages in availability of font styles, weights and sizes, but it can be quite slow. By and large, printers with PostScript interpreters are slower than printers driven by a PostScript board in the PC, but not all such boards are supported by all the software which can work directly with PostScript laser printers. Another potential problem is compatibility. PostScript is a device independent language: that is, a PostScript program should give equivalent results when printed on devices of differing resolutions. So, it becomes practicable to proof-read PostScript material on a laser printer, take the source to a typesetter with a PostScript machine, and be sure that the two will match in every respect except that one will be printed at 300 dots per inch (dpi) and the other at say 1200 dpi.

But this facility depends on the complete compatibility of the two PostScript interpreters. If you plan to take this route, you should test it out first by printing sample documents on the printer you plan to buy and the typesetting system you hope to use. If both systems use boards made by Adobe, the creator of PostScript, you should have no problem. Where one or other is only licensed from Adobe — or, far more serious, is one of the new breed of PostScript clones — you should test the systems very carefully before buying.

Printers vary significantly in the number of fonts included in the purchase price. Many have just two fonts, perhaps in bold and italic as well as the normal style and weight. Additional fonts tend to be quite expensive — while a PostScript printer with a range of fonts may seem an expensive buy at first, it may be cheaper in the long run. If you have a PostScript printer, you will also have a much more extensive range of additional fonts available from Adobe itself and from Bitstream.

Adobe fonts are relatively simple and fast to install, and are much more economical of disk space than those from Bitstream, which take a very long time to install. Adobe also supplies a routine which allows you to pre-load fonts which will be used for several documents, whereas Bitstream fonts are always cleared from the printer after each document is printed. However, Bitstream supplies a range of fonts for eye-catching headlines, and the company's fonts can also be used on Hewlett-Packard LaserJet printers and compatibles.

Screen fonts

In addition to buying extra printer fonts, you can also buy extra screen fonts to supplement the basic fonts which come with your software. These, I feel, should be used with even more discretion than printer fonts, since they are very greedy of disk space and tend to slow most software down. I am sceptical about the advantages of true WYSIWYG fonts, at least at the smaller point sizes, because screen display resolutions are coarse relative to even a 300 dpi laser printer. The screenshots in Fig 3 show the same text displayed in default and WYSIWG modes.

Style guide

While the freedom to choose your own layout has great attractions, it can go to your head and give your readers eyestrain. Some fonts are more suitable for particular applications than others; Fig 2 suggests some of their best uses, while Fig 4 suggests specific applications. In combination, it is better to keep to two fonts for a single document, and at most, to four variations of size, weight and style on one page.

Every change of font, size, style and weight should have a reason — don't just alter them arbitrarily. Capital letters are harder to read than lower case, and underlining distracts the eye from the text it is supposed to emphasise.

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Timeworks DTP

Atari's attempt to establish itself in the business market has been strengthened by the launch of Timeworks DTP, a competitively-priced desktop publishing package which could give established programs a run for their money. Roger Howorth came to grips with it.

With the recent release of Atari's Mega ST and Laser Printer, the company is in a position to provide a credible alternative to PC and Macintosh desktop publishing (DTP) packages at a fraction of the cost. It was nearly a year ago that Publishing Partner and Fleet Street Publisher, the first Atari DTP programs, were released, apparently in anticipation of the more powerful Mega/Laser ST combination. These products were well-received and have sold successfully, but neither has become the 'official' Atari DTP package.

However, this position could soon be filled. GST has finally released Timeworks Desktop Publisher, hoping perhaps that if Atari intends to choose a DTP package to spearhead its drive into the business sector, now is the time and Timeworks the product. GST is no stranger to producing 'official' Atari software, having written First Word, the word processor that, until recently, was bundled with every ST. Neither is the company a stranger to DTP: a number of the programmers involved in the Timeworks project have had years of experience writing typesetting software for various newspaper publishers.

Like all GST products, Timeworks DTP can also be run on any GEM-based PC or clone, and generally this review applies to either machine. The only differences between the two versions lie with the different implementations of GEM on the host machines and their relative processing speeds. On the Atari ST, with its fast Motorola 68000 CPU, the use of GEM does not noticeably affect the running speed of applications programs; whereas on the slower PC or AT clones, GEM struggles to keep up with the user's instructions and is, therefore, slightly more cumbersome to use. This is obviously a 'fault' with the computer rather than any piece of software, and is made less serious if the host machine has a faster processor than the original 4.77MHz Intel 8088.

Overview

Timeworks DTP is supplied on four single-sided 3.5in disks and comes with a boxed, ring-bound manual of some 120 pages.

Text files can be imported from GST's own word processor, First Word, as well as WordWriter ST or PC, WordStar and WordPerfect. ASCII files can be used and page formatting commands can be embedded within text files very easily, which saves a lot of time.

Throughout the program, a variety of measuring systems can be used. These are controlled from the 'Set Ruler' menu option and allow sizes to be quoted in either inches and tenths, inches and eighths, centimetres, or picas and points. (This last term is printer's jargon: a pica is one sixth of an inch, and a point one seventy-second.) The rulers can be displayed around the edge of the window to help line things up.

Auto-hyphenation is provided although this can be overridden by the user if desired: the program can run without inserting hyphens, or you may position your own hyphens. Both these options can be used within a given document or can be written into the program's hyphenation dictionary, thus becoming part of the automatic hyphenation system.

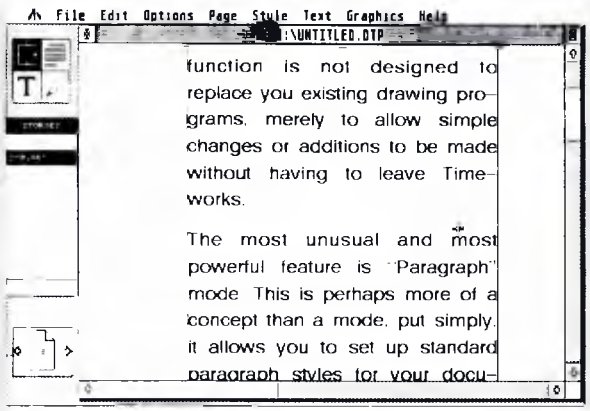
Kerning is available, although not automatic ('kerning' is yet more printer's jargon for adjusting the space between two characters). Timeworks DTP allows the units by which characters are moved to be set to either a positive or negative number in the measuring unit defined by the ruler. In this way, letters can be moved apart if they have been over-kerned.

Headers and footers can be defined for every page, or they can be specified for left or right-hand pages. They can be set in any one font and size, and can be augmented with as many graphics images as you like.

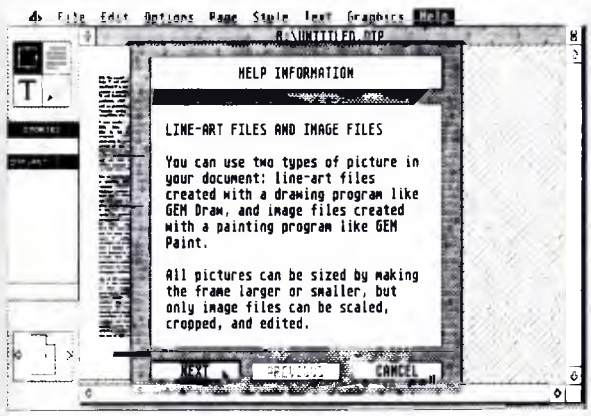
Installation

Before you can use Timeworks DTP, you must run an installation program to configure it to your system. The installation program is contained on one of the master disks, and selects the correct fonts for your screen and printer as well as the various system files for your machine's memory size and storage devices.

,On the Mega ST, the minimum hardware requirement is for two single or double-sided disk drives. This may irritate those 1040ST users who don't have a second disk drive as there is no obvious difference in storage capacity between two single-sided drives and one double. The reason for this apparently odd requirement is that Timeworks DTP uses various overlay and system files which must be constantly available to the program; if you keep all these files


File Edit Options Page Style Text Graphics Help
A:\UNTITLED.DTP
function is not designed to replace you existing drawing programs, merely to allow simple changes or additions to be made without having to leave Timeworks.
The most unusual and most powerful feature is "Paragraph" mode. This is perhaps more of a concept than a mode, put simply, it allows you to set up standard paragraph styles for your docu-

The basic screen layout of Timeworks DTP. A selected box is shown with a single column of text. Notice the selection icons on the left and the page indicator at the bottom of the screen


HELP INFORMATION
LINE-ART FILES AND IMAGE FILES
You can use two types of picture in your document: line-art files created with a drawing program like GEM Draw, and image files created with a painting program like GEM Paint.
All pictures can be sized by making the frame larger or smaller, but only image files can be scaled, cropped, and edited.
CANCEL

Help can be popped up while you're working to remind you of any operating details you might have forgotten. Once in the help system, you can move through it to find new items

on one disk in one drive, there is little chance of anything going wrong. You need the second disk drive for your own files of text, graphics, and so on.

If you use a hard disk, life is much simpler and faster. Having given the installation program details of your printer — which is all done using one GEM dialogue box and several 'buttons' — the disk will then copy all the files to the right places. This process takes around 20 minutes with floppy disk drives but it has to be performed once only unless you reconfigure your hardware by adding more storage or changing your printer. Timeworks supports most common printers, such as the Epson 9 and 24-pin or compatibles; the Epson GQ 150 and 300 dpi laser printers; the HP LaserJet and the LaserJet Plus; and the Atari and PostScript laser printers.

Depending on which printer you use and how much RAM you have, the installation program will decide which fonts you can use and in how many sizes. For example, if you opt for a PostScript printer, you can use Courier, Helvetica and Times fonts only; however, you can use them in any of ten sizes ranging from 7 to 72 point.

If you have enough RAM and any other kind of printer, you'll have sans serif, roman serif, and slab serif fonts in a choice of nine sizes ranging from 7 to 72 point, plus two other fonts used for text effects. One is called Bullets and provides various symbols that can be used to indent paragraphs; the other is called Drury Lane and provides display capital letters. These two fonts are available in a limited range of point sizes.

In use

The Timeworks DTP screen consists of a standard set of menus along the top which control the program's more mundane functions, such as disk operations; and a set of icons down the left-hand edge that allow access to the more frequently-used functions.

A large, scrollable window to display your document occupies the rest of the screen. This window cannot be moved or resized, nor is it possible to have more than one document open at a time. Documents cannot be appended to

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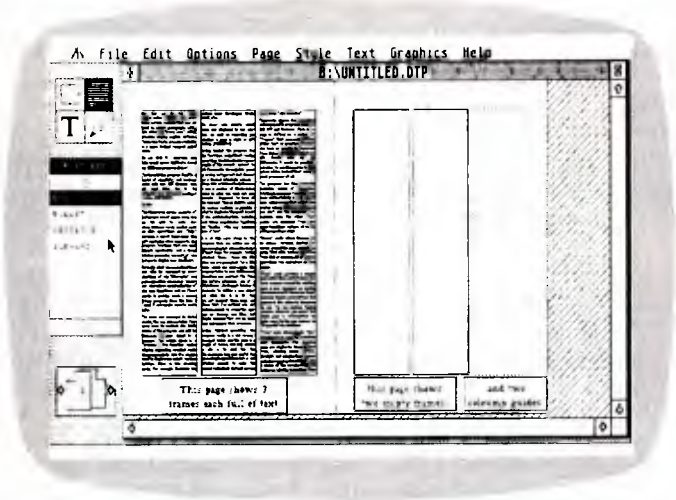
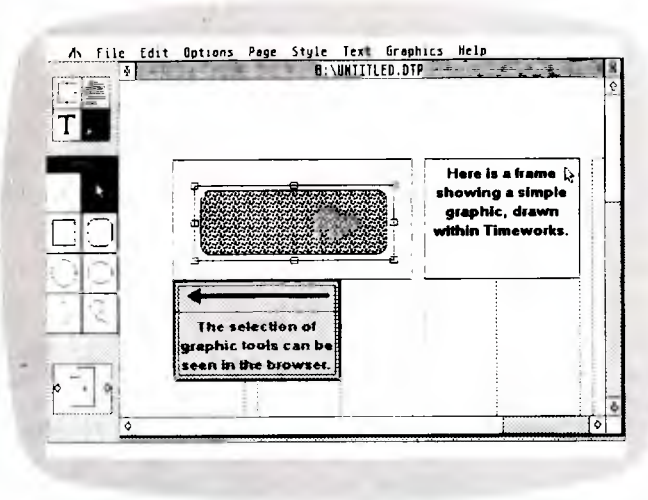


You can view your work in several ways, including enlargements and full-page views. This is a double-page spread in its entirety. The paragraph styles for this document are on the left


File Edit Options Page Style Text Graphics Help
B:\UNTITLED.DTP
Here is a frame showing a simple graphic, drawn within Timeworks.
The selection of graphic tools can be seen in the browser.

Besides text operations, Timeworks has graphics operations available. The box on the left changes to a menu of the graphics commands available. Some examples of output are shown on the main screen

other documents. It is possible to toggle the window to fill the entire screen, thus hiding the icons and gaining a slightly better view of the document.

Virtually all of the menu functions can be accessed by combinations of the 'Alt' key and another character; however, there is no such duplication of the icon functions, so Timeworks DTP is pretty much a mouse-driven program. Nonetheless, I found that working with it was extremely easy.

The icons are arranged in three blocks. The top block contains four icons used to control the basic modes of the pro-

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gram. The middle block is a 'browser'; its function varies depending on which mode the program is in, but it's always used to display and select various options. When in the 'drawing' mode, for example, it shows tools such as 'Box Shapes', 'Circle', and 'Pencil'. The lower icon selects the pages to be displayed in the main window, and serves as a reminder of whether a page is right or left-facing.

Having loaded the program for the first time, and without reading more than the introductory paragraphs of the manual, I set out to put Timeworks through its pace by typesetting an article. To make the test as realistic as possible, I tried to duplicate the exact layout of the published article, including such details as point size, typeface and leading (the space between the lines).

Timeworks DTP really is a joy to use. I managed to lay out the page in a couple of hours, and rarely needed to refer to the manual. The onscreen help was useful for simple operations but not detailed enough to make the manual redundant, instead serving more as an *aide memoir.*

The program shares its operating philosophy with programs such as GEM DTP and Ventura, in that a page is defined as a series of 'frames' which may each contain either text or graphics. Whether the text or graphics are imported from disk or entered directly from within Timeworks DTP makes very little difference. It would be possible (but slow) to use Timeworks DTP to lay out an entire book without using a word processor at all.

The program has five mutually exclusive modes of operation. Printing is accessed from the main menu and is strictly a foreground task, which means that while the printer is busy with your document, you can't use the computer for anything else.

The other four modes are accessed from the upper icon block and are used to prepare pages. 'Frame' mode allows frames to be drawn, re-sized, deleted or moved around the page as well as being filled with text or pictures from disk or memory. All of these operations rely exclusively on the mouse.

While in Frame mode, the browser initially displays the filenames of the 'stories' or text documents that are currently loaded in RAM. From here the story can be placed into frames by clicking in a frame and the story name with the mouse. If a story is too large for one frame, it can be made to flow into other frames by selecting them and the name again.

It is equally easy to place pictures into your document. The browser has a 'title' which will initially be 'Stories'; clicking on that will toggle it through to list the resident 'Line Art' and 'Image' files. From here pictures can be loaded into frames in the same way as text, except that pictures cannot flow between frames. They can, however, be re-sized and cropped.

'Text' mode provides a simple text editor. Once activated, you can move a cursor around the existing text in your document by moving the mouse or using the cursor keys; text can then be entered from the keyboard. The editor becomes tiresome to use for any serious typing, because the whole page is constantly being reformatted to make room for the new text or to fill gaps left by deletions.

In Text mode, the browser displays the various GEM effects that can be applied to the basic fonts. These include bold, italic, underline, and so on. These text effects can also be accessed from the main menu.

It is possible to cut and paste blocks of text from one part of the document to another, and blocks can be re-styled with text effects by clicking on the new styles in the browser.

'Draw' mode allows simple line drawings to be made to embellish your documents. The drawing tools are similar to those in Gem Draw, allowing boxes and circles, and straight and free-hand lines to be drawn and, where appropriate, filled with a choice of the standard GEM fill patterns. Like the text editor, this function does not replace your existing drawing programs; it merely allows simple changes or additions to be made without having to leave Timeworks DTP.

The program's most unusual and powerful feature is its 'Paragraph' mode. Put simply, this allows you to set up standard paragraph styles for your documents, which in turn give your work a consistent look. The idea is that each paragraph is linked to a 'paragraph style' which defines the font, leading, word spacing and justification of text within that paragraph.

The available paragraph styles are displayed in the browser, which can be scrolled if the list is too long. You may, for example, have a style called 'headline' which causes all paragraphs linked to it to be set in 72-point, left justified, Swiss font. You can edit a paragraph style by double-clicking on its name from the browser and using various dialogue boxes. Having done so,

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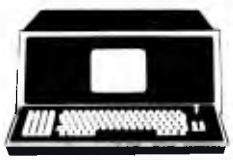

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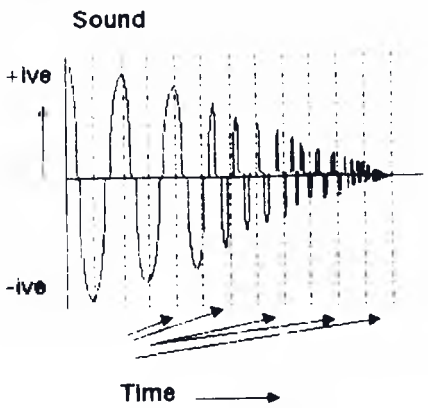
Sampling is one of the basic methods of sound production using computers. It involves digitally recording a sound into RAM, perhaps editing it in some way and finally playing it back, either as a rhythmic effect, or as a musical note.

The theory of digital recording is fairly straightforward: a sound is presented as an electronic signal to an analogue to digital converter (ADC) - think of this as a camera continually taking snapshots of the voltage present at the input. These drive for sample storage, you'll end up with samples that only a few seconds sampled at more than 8 bit/ 20KHz.

Editing tools

Software aids vary between systems, with some having no facilities for editing or indeed permanent storage. Others only allow the front and end of your sample to be moved to make the sample shorter. More exotic systems, though, allow for amplitude changes and merging of different samples, the list of options growing



An example Timeworks printout from an HP LaserJet Plus at 150 dpi

the whole document is automatically reformatted to take account of the changes. New paragraph styles can be added in a similar way.

Whenever text is loaded into a frame it defaults to 'Body text' style, which would usually be something like 10-point, fully justified in your favourite font. In order to change a paragraph to another style, you click on the paragraph with the mouse and then click on the new style from the browser. Style commands can also be embedded within the text as your prepare it on your word processor.

Graphics

Graphics is the one area where I experienced problems with Timeworks DTP. I tried to import three pictures into my test page: two of these were standard GEM object files; and the third was a Degas image. Timeworks DTP claims to accept pictures in both these formats as well as GEM IMG, Neochrome NEO, Lotus PIC and PC Paintbrush PCX files. In fact, the Degas file that I tried to import was brought in with its colours inverted, thus my black and white picture became white on black. This can, of course, be cured in Degas by inverting the colours before saving, but that must be like opening the stable door in preparation for a bolting horse!

The GEM object files were even more tricky. I use Easy Draw to prepare pictures which look fine from within Easy Draw and still look fine when loaded into other programs such as GEM Output. While drawing these pictures I occasionally need to delete unwanted bits, which is done by dragging them to the 'trashcan'. Being human, I sometimes miss the trashcan; this doesn't matter because if those bits are off the page, they're out of the picture . . . Well, they should be, but not with Timeworks DTP. It's true that Easy Draw shouldn't save these bits of 'rubbish', but it's equally true that Timeworks DTP shouldn't load them because they are off the 'page' which is defined in the GEM object file.

With these pictures loaded into Timeworks DTP, the rest of the functions worked well. Image files can be cropped to size, and there is a pixel editor which, although crude, is good enough to perform simple 'touch-ups'. There is no facility for editing object files, but they can be resized quite accurately. Text embedded within illustrations often becomes unreadable after scaling down, and is best deleted from the picture and overlaid directly from the program.

When resizing images, Timeworks

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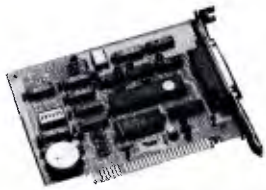

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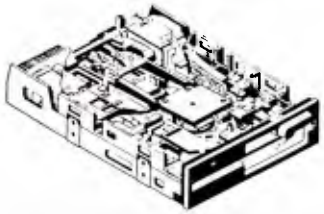

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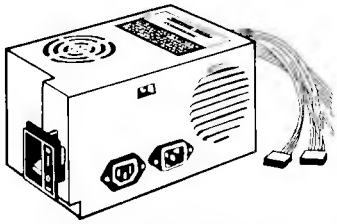

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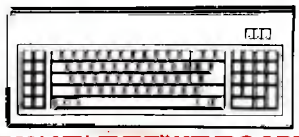

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DTP can be made to preserve the aspect ratio of the original picture and can be forced to use a system of 'whole pixel scaling'. This avoids unsightly tartan effects that can occur when rescaling to a size that the output device (printer) cannot accurately represent.

Fonts & overlays

Timeworks DTP uses a number of different fonts, depending on memory size and printer. These are standard GEM fonts and could, therefore, be used with other well-behaved GEM applications. Or, indeed, if you have other GEM fonts in your software collection, they could be installed for use within the program.

The problem with using GEM fonts is that they take up a great deal of memory, because each letter of each font in every point size must be represented by a bit-map.

In order to leave as much RAM free for fonts and documents, TImeworks DTP uses a number of 'overlays' (chunks of program that are loaded into memory only when you try to use that bit of the program). Once loaded, these overlays are kept in RAM unless that space is needed for something else or until you start to print out a document, in which case all the overlays and screen fonts are dumped in order to make room for the printer fonts. The net result is a lot of disk accessing whenever you want to do some printing.

GST is renowned for its friendly software and has obviously gone to some trouble to make the use of overlays as pleasant as possible. Whenever an overlay is being loaded into RAM, the mouse pointer changes from the normal GEM arrow to a special disk shape which helps you keep track of your memory usage. Using a 1Mbyte machine, approximately 380k is available for documents after all the overlays have been loaded.

Printing

Timeworks DTP uses the standard device drivers from the GEM Output program developed by Digital Research and therefore supports a good range of printers, including the Atari Laser Printer. However, because Timeworks DTP needs to know which printer you'll use at the installation stage, it's impossible to switch between printers from within Timeworks DTP.

Also impossible on the current release is printing files to disk. This would have been very useful to the less wealthy among us who could produce draft output on a nine-pin printer, before finally printing a PostScript file to disk to be sent off for professional typesetting.

The Mega ST/Atari Laser Printer set-up has a tremendous speed advantage over other combinations, because rather than using a Centronics interface, it is connected to the ST through the DMA port. In practice, this means that a printout takes only 90 seconds for a full page compared with two and a half minutes on a typical laser printer.

Output on to dot-matrix printers is obviously not up to the same quality as a laser printer, but by way of consolation, slightly faster — a full page takes about seven and a half minutes.

None of the above-mentioned timings includes the time taken to swap between screen and printer fonts.

Documentation

The manual is generally well written, if rather brief. There are sections to guide the novice user through the basics of page layout and on to more detailed explanations of the functions. Unfortunately the index is poor, being simply a list of paragraph headings.

Conclusion

Timeworks DTP is available for the Atari ST range of computers now, however the PC version is yet to emerge. There are other DTP packages available for the ST and the PC which by now are well-established, but few of them compete with Timeworks in terms of price and performance. Publishing Partner and Fleet Street Publisher are both capable programs, but neither of them are as easy to use.

Fleet Street publisher offers a graphics library and more fonts at the expense of fewer point sizes. Timeworks DTP does not have a graphics library but has more flexible functions. Publishing Partner uses an ingenious system for its fonts that allows the user huge flexibility while saving the computer's RAM for documents, but most people find it a frustrating program to use. It is particularly inflexible when importing text and letter spacing.

In the PC market Timeworks DTP has much more competition, with some programs being leagues ahead in terms of facilities. There isn't much, however, within its price range.

END

Timeworks DTP costs $355, and is available through Edsoft, 2 Apollo Court, Blackburn 3130. Tel: (03) 878 4746 or (008) 33 8873.

Ready,Set,Go!4

The latest release of Ready Set Go! for the Macintosh offers impressive text-editing improvements and grid design facilities. But, says John Donaldson, ultimate typographical control is yet to come.

In the fast-moving world of microcomputers, nothing it seems, moves as fast as desktop publishing (DTP) software. This is especially true in the Macintosh market where the three big DTP companies seem to launch new versions of their software every six months.

On the face of it, the pace of change in the market would seem to be good for the consumer. However, with the software companies rushing to outdo each other by adding new features to their products, sometimes the debugging is not done properly. The result is that the software doesn't always behave in the way you expect it to.

In this review, I'll take a look at version 4 of the popular Ready Set Go! DTP package which is produced by Letraset.

Packaging

The packaging of RSG!4 is much more comprehensive and impressive than the previous version of the product. The packaging consists of two binders marked 'Disks' and 'User's Guide'. The 'Disks' binder opens up to reveal an audio cassette and a book entitled 'The Grid Book: a guide to page planning', as well as a large plastic wallet which contains the three Macintosh distribution disks.

The use of an audio cassette as the basis of a tutorial is quite common these days, but it is the first time that a tape has been supplied with Ready Set Go!. I'm sure it would prove useful to some people, but I think that most experienced Mac users will find its pace too slow and will prefer to experiment with the program at their own speed.

The 'User's Guide' folder contains the RSG!4 manual along with the warranty registration form and advertising material for an electronic picture re-touching program called Image Studio which is also sold by Letraset.

Installing RSG!4 is simply a question of copying the program and its associated dictionary file from the distribution disks to your Mac's hard disk. The program is also supplied with a system disk containing an old pre-MultiFinder version of the Mac operating system. As we will see later, running the correct version of the Mac operating system can prove critical to the correct functioning of RSG!4.

'One advantage of RSG!4 over RSG!3 is that it is now possible to lock objects so that they cannot be moved ... useful for layouts which will be used over and over again.'

In use

RSG!4 is started in the usual Macintosh fashion by double clicking the program icon from the Finder. Once it has loaded, the program automatically displays an empty document window so you can go straight into designing a page.

At this stage the first difference between RSG!4 and the older RSG!3 becomes apparent. Although RSG!3 and RSG!4 share very similar menu commands and window structures, RSG!4 displays all its page design tool icons in a row along the top of the document window. The old style RSG!3 used separate toolbox windows which weren't incorporated into the document window. The new approach is more suited to large screen displays and multiple documents where the incorporation of the design tools into the main document window means you don't have to move the mouse as far to select a tool.

The tools themselves are unchanged from RSG!3. They are divided into four groups and allow you to create and edit text and graphics; add lines and boxes to a page design; and select a page from a multi-page document.

Page design

Assuming you want to start from scratch and design a new document, the first stage is to create a page layout. One of the great advantages which RSG!4 shares with the older RSG!3 is that the design of a page is totally separate from the text or graphics which are finally placed on the page. This means you can use the same page design over and over again with different sets of text and graphics. A similar approach is used by Quark Xpress, but the other leading Mac DTP package, PageMaker, doesn't allow this.

The first step towards creating a page layout is to decide on the page size. One of the criticisms of RSG!3 was that it didn't force you to set the page size; consequently, you could accidently produce a layout on the wrong size paper. Unfortunately RSG!4 not only

shares this fault, but also makes it worse.

Most Mac programs have an option under their File menu called Page Setup. This gives you access to the standard Mac printer drivers and allows you to set the page size. Most DTP packages modify this standard menu to allow for a wider range of page sizes. Unfortunately, the Page Setup option in RSG!4 produces a totally non-standard window. Although this allows you to set a page size up to 99in x 99in, it does not allow you access to some of the standard Mac printer driver options. These are accessed from the Printer Setup menu which displays the standard Mac printer driver.

The upshot is that it's possible to have some options set correctly and some set incorrectly. This can be extremely annoying, particularly if you find out *after* you have spent hours working on the page design.

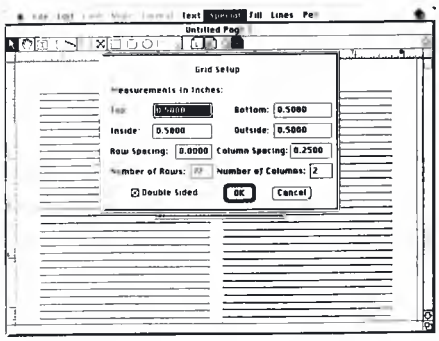
Assuming that you manage to get the page size set up correctly, the next stage is to set up the page 'Grid' — a grid is simply a set of vertical and horizontal lines which are used as a guide when you come to lay down text and graphics. Although grids are used almost universally in manual page make-up, most computerised DTP systems ignore them. The one exception is Ready Set Go!

A grid has two main advantages. First it makes sure that everything lines up on the page both vertically and horizontally. Secondly, the use of a grid allows you to create a basic structure which underlies the whole publication. This means that although different pages can vary in their layout, they all conform to the grid. This gives a publication continuity.

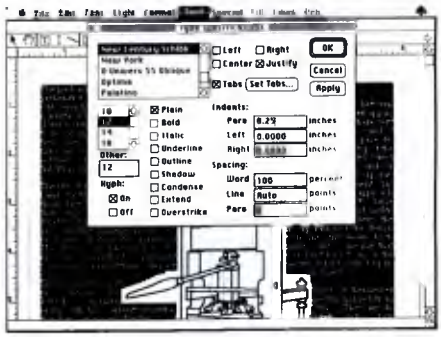
Grids are set up in RSG!4 by selecting Design Grids from the Special pull-down menu. This gives you the option of using a standard grid or designing your own. The standard grids range from one row by one column to eight rows by eight columns. I don't generally find any of these useful and prefer to design my own grids. This is done by selecting Grid Setup. Here you can specify top, bottom, inside and outside margins, the number of rows and columns and the gaps between the rows and columns.

Before specifying a grid, it pays to give some thought to the different variables involved. Also, make sure none of your settings exceeds the maximum page size, otherwise RSG!4 will simply come back with an error message and ask you to think again.

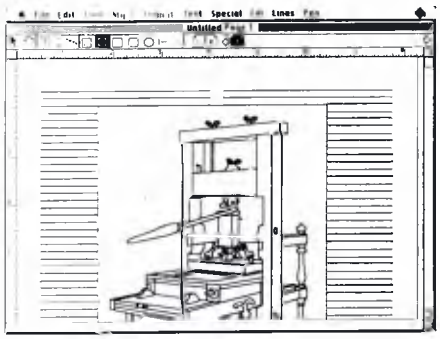
As you set up the grid, it can be useful to specify how you want the document to look on the screen. This is



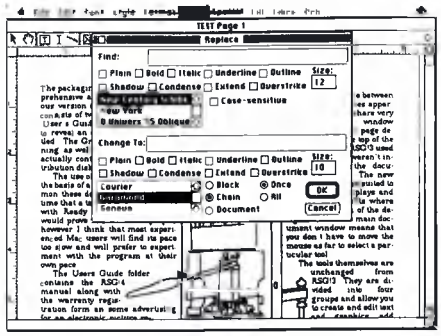
The 'Grid Setup' menu is one of the most important aspects of RSG!4. You can use it to set up margins as well as the number of grid lines



The Type Specifications window allows you to control all aspects of the type. The Word spacing option is particularly useful



To import a picture into RSG!4, you first need to create a graphics block and then import a picture (in this case an Encapsulated PostScript drawing)



Holding down the Option key while selecting Find or Replace allows you to search for type specifications as well as words and letters

achieved by using the Preferences command from the Special pull-down menu. Preferences allows you to change the measurement units to inches, centimetres or picas and points. It also allows you to specify whether such things as the ruler, grid and print area outline are displayed on screen.

It was in the Preferences section that I came across the first bug in RSG!4. If you are using a Mac II and select 'Use Fractional Widths', all the characters on the pull-down menus overlap each other and it is impossible to read any of the menus.

Once you have the page size and grids set up, you can decide where text and graphics are to be placed on the page. This is done using 'Text Blocks' and 'Graphics Blocks' to represent the areas where text and graphics will eventually be placed.

A text block is created by selecting the Text tool from the toolbox and can be placed on the layout by using the mouse to point and drag. Text blocks are represented on screen simply as a white oblong box which can be re-sized and moved in the usual Mac fashion by grabbing a corner and dragging with the mouse. Text blocks will automatically 'Snap' to the nearest vertical and horizontal grid lines so it is easy to make sure that different text blocks line up correctly.

In addition to the grid, the exact co-ordinates of each text block are displayed in a specification sheet which can be accessed by selecting Specifications from the Edit pull-down menu. By typing new co-ordinates into the specifications sheet, it is possible to control the positioning of a text block to a high degree of accuracy.

Sometimes you will want the text which is finally placed in the document to run from one text block to another. This is done by selecting the linking tool from the tool box. Text blocks are linked simply by clicking on them in the order you want the text to run. The final block is specified by double clicking the mouse.

Graphics blocks are controlled in the same way as text boxes. All the controls are the same and blocks can be posi-

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tioned with the same degree of accuracy. A graphics block is displayed as a rectangle with a large cross drawn through it.

Another advantage RSG!4 has over RSG!3 is that it's now possible to lock objects so they cannot be moved. This is extremely useful if you are designing layouts which will be used over and over again by less experienced operatives. Previously it was only too easy for a user to move or re-size a text or graphics block accidentally, thus ruining the layout. Now that objects can be locked, this is no longer a problem.

Another welcome addition is the ability to display and work on facing pages. Using this option you can lay out a double page spread and run text and graphics blocks across two pages.

Text editing and typography

Up until now, RSG!4 has shown only minor improvements over its predecessor. However, several improvements have been made in the area of text editing.

Text can be placed in a text block in one of two ways. You can type it straight into the text block, or you can import a story from a word processor file. RSG!4 can import files from most of the popular word-processing packages, including MacWrite and Microsoft Word. If all else fails, you can save a file of plain text and import it that way. Once the text has been entered, RSG!4 offers a wide range of word processing tools to allow you to format the text just as you want it.

Most of the important word-processing commands are incorporated into the Text pull-down menu. The first functions on this menu are Find and Replace. The find function allows you to locate a specified piece of text within a document. In addition to text, the Find command can search for a range of special symbols and control characters. This makes it very useful for making wide-ranging changes to text.

The most useful addition to the Find command is that if you select the Find command while holding down the Option key, you get an expanded Find option window which allows you to locate different text types. This allows you, for example, to find all text set in a particular type and size and replace it with a different face in another size. This is a useful function for making large scale typographical changes.

The next section of interest is RSG!4's handling of tabulations. This is perhaps the most impressive addition to RSG!4. It is now possible to set a measure for each tab set. This means that text which is allocated to a tab will wrap around within the measure to form a neat column. Tabs can be set to range left, right, be centred or justified, so that you can, for example, have text justified within a tab. All this is useful for tables and so on.

RSG!4 has the ability to use Style Sheets — you can now allocate different style names to different typographical combinations. For example, you could set up a style called 'Headings' and set it to a medium-sized bold typeface centred. Then you could allocate the style to all the headings in your article. If, at a later date, you decided you wanted all the headings to be displayed in a different typeface, you would simply change the entry in the style sheet and all the headings in the article would be changed automatically.

'Although the typographical control of RSG!4 has been improved, it still isn't a match for packages such as Quark Xpress...'

Although the typographical control of RSG!4 has been improved, it still isn't a match for packages such as Quark Xpress.

One of the biggest limitations of RSG!4 is that you can't specify fractional point sizes or leading. This means that certain popular type specifications such as 9.5 on 10 point can't be specified in RSG!4.

Having said that, RSG!4 does offer some very useful typographic commands. As you would expect, the package offers hyphenation and justification. The hyphenation in this case is determined by an algorithm built into the software rather than by using a hyphenation dictionary. A hyphenation exceptions dictionary can be set up by the user.

RSG!4 also offers automatic and manual spacing of various letter pairs to enhance their appearance when they are printed. This is especially important for headlines, where all DTP systems put too much space between the letters.

One strange feature of the design of RSG!4 is that the typeface and point size, leading, and so on, can all be specified in a number of different pull-down menus. The easiest place to specify type characteristics is from the Type Specs command in the Text pull-down menu. This produces a large window which contains a scrolling list of typefaces and point sizes along with check boxes for type style and alignment. The Type Specs box also allows you to specify paragraphs; left and right indents; and word, line and paragraph spacing. All of these options can be set from various other pull-down menus, but the advantage of Type Specs is that they are all displayed in one place.

One interesting typographical feature of RSG!4 is the word spacing option. This controls the amount of white space between each word and is specified as a percentage. Altering the value can be a useful way of making a piece of text fit a pre-defined space. If you want to make an extra line, for example, you can alter the word spacing rather than write extra text.

The final typographical enhancement which has been incorporated into RSG!4 is the ability to run around a complex shape. This means you can get text to follow the outline of any graphic image on the page. This can produce various professional-looking effects.

Graphic images

RSG!4's handling of graphic images is very similar to the previous versions. Graphics can be imported in a number of popular file formats including PICT, TIFF and Encapsulated PostScript. Strangely, RSG!4 can't read the file format used by Letraset's Image Studio program, so files have to be imported as either TIFF or Encapsulated PostScript. This is a shame because both of these formats take up much more disk space than Image Studios' native file format.

Another shortcoming of RSG!4's graphics is its inability to edit scanned images or to handle colour graphics — the latest versions of Quark Xpress can do both.

RSG!4 and typesetters

Because of RSG!4's advanced Tab capability, I decided to use it to produce 15 pages of typeset tables every month. I therefore spent a great deal of time using the program to drive a Linotron 300 phototypesetter. I must say that it was not a pleasant experience.

In theory, driving a typesetter should be the same as driving a PostScript laser printer. Bolstered by this thought I

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DTP

proofed my 15 pages on an Apple LaserWriter and then took the RSG!4 document to my local typesetting bureau. Imagine my surprise when I discovered that the Linotron output was totally different from the LaserWriter proof. The letter spacing and leading were totally wrong.

After a great deal of experimenting I got it to work, but I must conclude that RSG!4 is not to be trusted to drive a Linotron. If you are thinking of using RSG!4 to do this kind to work, I would recommend that you don't use a Mac II, don't use a MultiFinder and don't leave any of the type specifications set to 'Auto' within RSG!4.

Documentation

On a more positive note, the documentation for RSG!4 is very good indeed. I am sure that the audio cassette would be useful to beginners and the Users' Manual is very well set out with lots of screen shots and plenty of handy hints.

However, I felt the best thing was the inclusion of 'The Grid Book'. This is an extremely well written and useful guide to designing professional-looking documents. A constant drawback of DTP documents is that although the programs are very powerful, the people using them don't know what makes good graphic design. This has often resulted in very shoddy-looking documents.

With this book, everybody can learn the basics of graphic design and, hopefully, the quality of the documents will improve.

Conclusion

RSG!4 is nearly a very good product. The use of the grid as the basic design element is useful and the new improved word-processing capabilities are impressive. However, RSG!4 still loses out to Quark Xpress in terms of ultimate typographic control and graphic manipulation facilities.

The most worrying feature of RSG!4, however, is its apparent lack of quality control. Although the program doesn't crash, it does produce some strange results, especially when it is linked to a typesetter. I'm sure most of these problems stem from the need to get new versions of the software on to the streets as quickly as possible. If I were you, I'd wait for version 4.1 and hope Letraset has fixed the bugs.

END

Ready Set Go!4 costs $995 from Letraset Australia on tel: (02) 975 1033.

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Words & pictures

All the bells and whistles of true desktop publishing may be unnecessary — a top-end word-processing package could be all you need. Martin Wren-Hilton tests the virtues of five such programs.

Until recently, desktop publishing and word processing were viewed as different disciplines requiring different skills and tools or programs. And anyone wanting to do more than produce standard, fixed pitch text documents may have assumed that they would need to abandon the keyboard, capture a mouse and start using a full desktop publishing package.

But for many people, the next step from standard text processing is being able to mix different sizes and styles of type and to incorporate graphic images into the document. Additionally, many would like to see on the screen what will appear on the page.

For these users, top-end word-processing packages offer all the flexibility needed to generate good-looking letters, memos and other correspondence.

Before looking at five leading word-processing programs in detail, it is worth considering a 'wish list' of features that the ideal program should offer. The list below is by no means exhaustive, and I am sure some will consider certain features more important than others.

Speed

Word processing is an activity that requires quick responses. Early word processors could barely keep up with a decent typing speed. Nowadays users expect screens to scroll smoothly and quickly, disk activity to be short and sweet, and other internal processing by the word processor to be carried out in the space between key presses. The 'Benchmarks' box at the end of this article shows some benchmarks for the top five word processors.

Word processing, for the most part, is not a computer-intensive application like a spreadsheet, and disk activity occurs infrequently compared with that for a database application. It is therefore expected that word processors will run adequately on 8088-based personal computers.

Graphics

In an ideal world, word processors would give a true WYSIWYG impression on screen, but in reality only true desktop publishing packages like Ventura and PageMaker come close. There is a trade-off between graphics and performance — if you want to show fonts on screen as they will look on paper, then you need either a powerful graphics coprocessor or an 80386-class machine, otherwise performance stops you using the program easily. None of the five programs reviewed here offers WYSIWYG, although some achieve an acceptable balance and all (except DisplayWrite 4) offer a page preview feature which displays a 'greeked' version of the document. 'Greeking' is a technique which shows a rough approximation of the final output with squiggly lines representing the text.

' For being the most idiot-proof, MultiMate Advantage II scores high marks..'

The increasing popularity of the Microsoft Windows 2 (Presentation Manager) interface will undoubtedly create a large market for a high performance, high function package with good WYSIWYG capabilities. Windows Write, a small word processing program which comes free with both Windows 2 and Windows/386, is a sure sign of things to come.

While Windows Write offers none of the advanced features that you would expect of a top-end word processing package (like outlining, macros, snaking columns and so on), it gives a close approximation on screen of the final output with characters in the typefaces Times Roman and Helvetica appearing on screen in roughly the same shape and size as when they are printed.

Other word processing packages are available for the Windows environment, including WinText from Palantir and Comfotext from Siemens. Microsoft is developing a product — code-named Opus — that will be released later this year, which promises a high level of function. One advantage of running in a Windows environment is the ability to import graphics from other applications, although all the five non-Windows word processing programs that we will look at offer the ability to import graphics, one way or another.

Although Windows is a step in the right direction towards true WYSIWYG, the screen fonts that Windows uses (except for the Windows Paint program) are in a 'raster' format. In other words,

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the fonts are stored in memory as a series of dots.

During the next few years, a screen-based version of PostScript will become a reality, and only then will true WYSIWYG become possible. The neatness of PostScript is in the way it handles fonts.

PostScript fonts are represented by complex mathematical formulae, rather than rasters. That's why PostScript printers offer infinitely more flexibility than non-PostScript printers like the Hewlett-Packard LaserJet. The LaserJet (and all other non-PostScript) printers store raster fonts, which can only be reproduced 'as is'. By applying matrix transformation formulae to PostScript fonts, the output can be rotated, stretched, expanded, emboldened and italicised.

The penalty? Speed. PostScript printers usually feature either Motorola 68000 processors or 68020 processors and still take forever (or at least many minutes) to generate very complex output. In the meantime, we will have to satisfy our needs with today's solutions, which include the patented Ramfont system which features on Hercules' latest graphics cards.

Ramfont can best be described as a glorified text mode. Instead of displaying just 256 characters (which is all the IBM display adaptors can do in text mode), the new Hercules cards can display up to 3000 different character types. The extra characters are usually italicised, emboldened and otherwise enhanced versions of the standard ASCII characters, and the matrix which describes the shape of the character is held in RAM. Programs like WordStar 2000 Plus, WordPerfect 5 and Word 4 which support Ramfont operate at the speed of text mode, with the advantage of on-screen formatting that graphics modes normally bring.

DisplayWrite 4

IBM's DisplayWrite 4 is the latest incarnation of the popular Displaywriter. DisplayWrites 1, 2 and 3 offered the same user interface as the dedicated Displaywriters — and not a particularly friendly one at that. DisplayWrite 2 offered the same functions as the TextPack 4 module for the Displaywriters. Adding outlining, basic maths, and macros, DisplayWrite 3 incorporated the features of TextPack 6.

The changes to DisplayWrite 4 were mainly superficial — the product has roughly the same level of function as DisplayWrite 3. These alterations include pull-down menus and mouse support.

DisplayWrite 4 is compatible with IBM's word-processor system

Most editing and character formatting is done through mnemonic ALT and CTRL key combinations, although some (ALT+8: erase to the end of the line) are a little off-beat. However, when help is needed, DisplayWrite 4 boasts a very comprehensive context-sensitive help facility.

Of the five packages reviewed here, DisplayWrite 4 is the only program that cannot import graphics of its own accord. Interestingly, IBM's platform for personal publishing is a combination of DisplayWrite 4 and Aldus' PageMaker.

Another weakness of DisplayWrite 4 is its lack of support for non-IBM printers, except that it now supports the industry-standard PostScript page description language which is appearing on more and more laser printers, including IBM's own 4216 Personal Pageprinter. In IBM's defence, it is the only software publisher here that manufactures its own printer range, so I suppose it is natural that it should choose to support its own printers!

Advanced users can design printer drivers for other non-IBM printers, although this should not be attempted by the faint-hearted.

Coming from Big Blue, DisplayWrite 4 has been designed primarily for environments with host connections. Indeed, this program can exchange files with host-based documentation systems like DisplayWrite/36 and DisplayWrite/370 through the RFTDCA (Revisable Form Text — Document Content Architecture) format.

Pull-down menus allow selection by a scrolling selection bar, or an underlined command letter, or a command number, or a mouse selection. (Various standard mice are supported.) Menus lead to sub-menus and so on, but there is no quick way to get from a low-level menu back up to the highest level. The user has to step back one level at a time, which is rather tedious.

On the plus side, DisplayWrite 4 includes a full complement of the facilities you would expect: a line-drawing function allows you to create simple schematics and organisational charts; 'profiles' can be created for customising both the way DisplayWrite 4 works and the type of output it generates; and a UK English dictionary checks your spelling. However, DisplayWrite 4, for some inexplicable reason, does not include a thesaurus, whereas its cut-down sister program DisplayWrite Assistant does.

In summary, DisplayWrite 4 is a competent word-processing program, ideally suited to Big Blue environments where connectivity is important, although it does have some deficiencies compared with other products of this type.

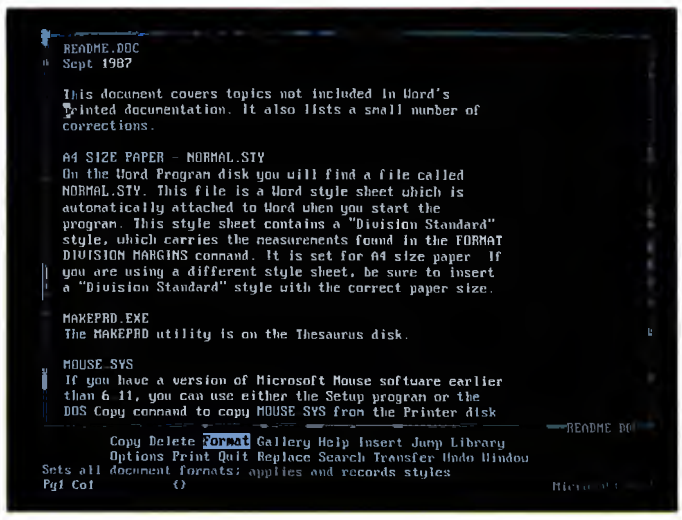
Microsoft Word 4

I have to confess a weak spot for Microsoft Word. It is a very good product — well thought out, well implemented and has been upgraded over time to accommodate the latest trendy features. With its sparring partner, WordPerfect, Word has battled for the top position all over the world — with great success.

Word 1 — previously known by the unfortunate name of 'MultiTool' — was probably the first word-processing program to offer PostScript support. From the very first version, Word's four biggest claims to fame are its powerful style sheets, multiple window support, mouse support and its 'almost WYSIWYG' display. Word 2 added a spell checker and better printer support. With Word 3, Microsoft added outlining and with 3.1 came a thesaurus. The latest release, Word 4, is faster than all three previous versions and adds macros, document management functions and revision marking — the last two being essential for producing documents in work groups where there are multiple authors or editors.

Word supports basically two screen types — text and graphics. In text mode, formatted characters appear highlighted (either in colour or just brighter), like most other word-processing programs. This is the fastest mode for scrolling around a document because a text screen is much quicker for the processor to construct than a graphics screen.

In graphics mode, although all different character point sizes are shown in the same height, formatting like bold, italics, superscripts, subscripts, strike-through and small capitals are shown on the screen as they should appear on the printer. This is, of course, if the printer supports those styles. If not, Word attempts as close an approximation as possible through the supplied printer drivers. Unlike previous versions, it is now possible to switch between these


README.DOC
Sept 1987
This document covers topics not included in Word's printed documentation. It also lists a small number of corrections.
A4 SIZE PAPER - NORMAL.STY
On the Word Program disk you will find a file called NORMAL.STY. This file is a Word style sheet which is automatically attached to Word when you start the program. This style sheet contains a "Division Standard" style, which carries the measurements found in the FORMAT DIVISION MARGINS command. It is set for A4 size paper. If you are using a different style sheet, be sure to insert a "Division Standard" style with the correct paper size.
MAKEPRD.EXE
The MAKEPRD utility is on the Thesaurus disk.
MOUSE.SYS
If you have a version of Microsoft Mouse software earlier than 6.11, you can use either the Setup program or the DOS Copy command to copy MOUSE.SYS from the Printer disk
README.DOC
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Pg1 Co1

Microsoft Word has always been one of the heavyweights of word processing. This screen shows it operating in text mode

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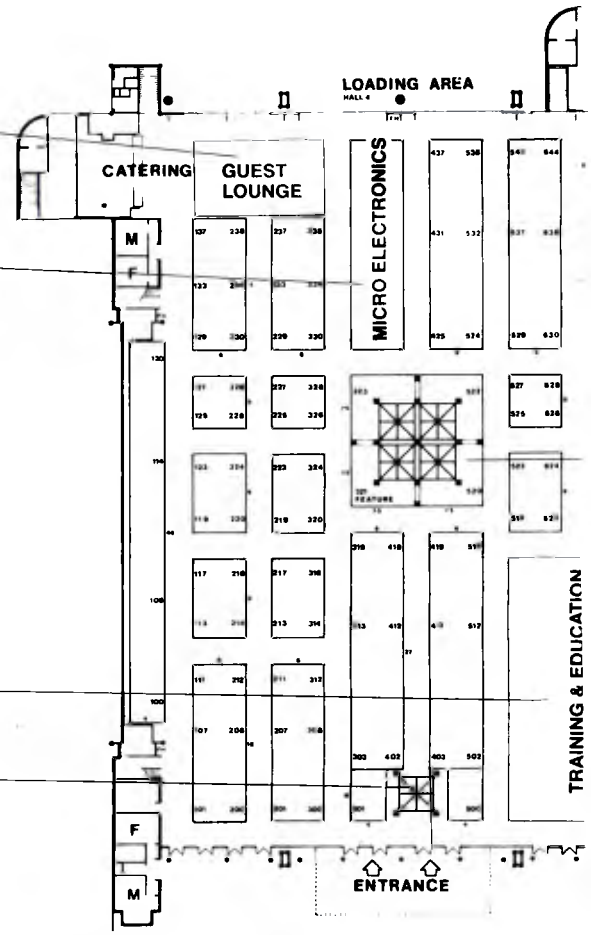

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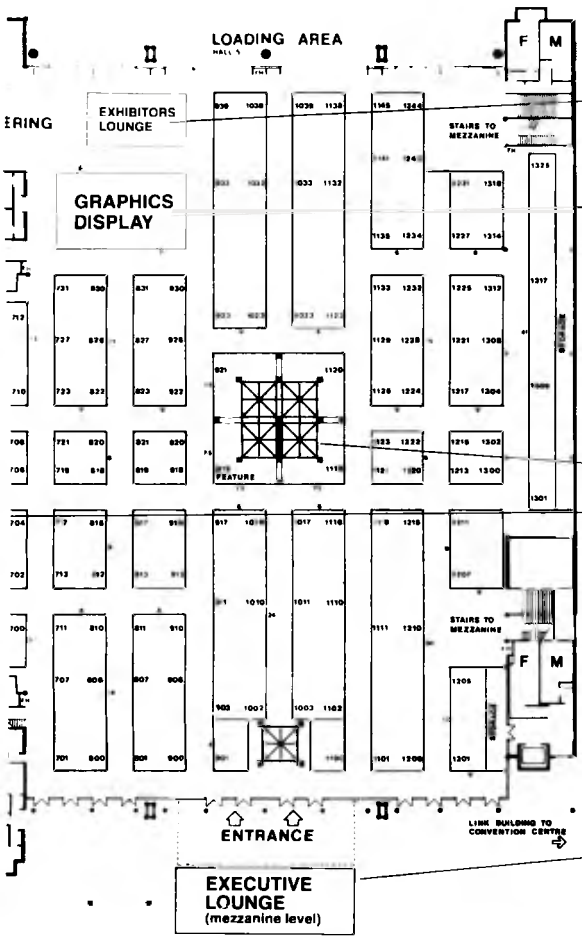

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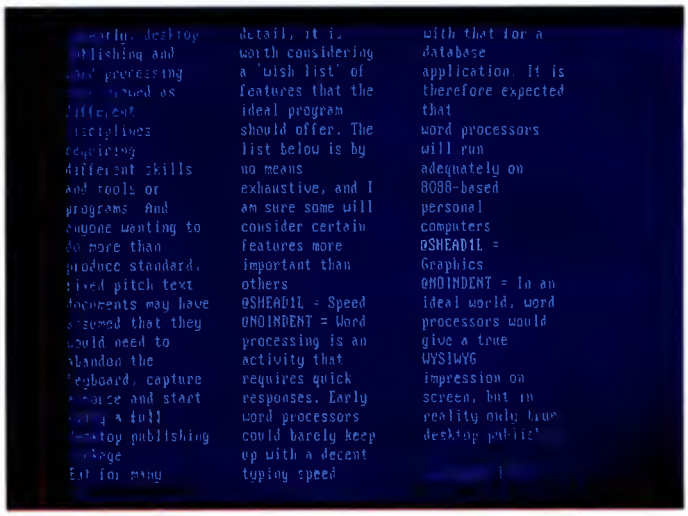
detail, it is worth considering a 'wish list' of features that the ideal program should offer. The list below is by no means exhaustive, and I am sure some will consider certain features more important than others
@SHEAD1L = Speed
@NOINDENT = Word processing is an activity that requires quick responses. Early word processors could barely keep up with a decent typing speed
with that for a database application. It is therefore expected that word processors will run adequately on 8088-based personal computers
@SHEAD1L = Graphics
@NOINDENT = In an ideal world, word processors would give a true WYSIWYG impression on screen, but in reality only true desktop publis

WordPerfect 5 now features multiple columns which continue from one page to another

text and graphics modes in the middle of a document.

The drawback of the graphics mode is that the processor takes longer to construct the screen because, rather than dealing with ASCII characters, it now has to deal with individual pixels. Earlier versions of Word received some flak for the slow operation in graphics mode, although Word 4 is considerably faster.

Word 4 also comes with a program called Pageview which runs under both Windows 2 and Windows/386. Pageview allows you to see a Word document on screen as it will appear when printed.

It also lets you insert graphics from Windows Clipboard into the Word document, then size them and/or clip them. You can alter the border and running head margins from within Pageview, see the result immediately on screen, and then either print the document (from within the Windows environment) or save the document to disk.

If you save the Word document with graphics, you cannot see the graphics from within Word. Instead, you see a command line in the document which links the document with a separate graphics file (usually located in the same subdirectory as the Word document, with the same 8-character filename but with an extension like .P00 or .P01). If the document is printed by Word, a blank space is inserted where the graphics would otherwise be.

Like so many tacked-on programs, Pageview is a good idea but badly implemented. For a start, Pageview uses the printer drivers provided with Windows to format (and print) the compound document. I use an IBM Proprinter for most of my work, and although the Word printer driver (IBMPRO.PRD) can generate NLQ — Near Letter Quality — output, the Windows printer driver for the Proprinter (PROPRNT.DRV) generates large raster-graphics fonts.

To try to get round this problem, Pageview is supplied with printer driver translation tables (!) to convert from Word's .PRD drivers to Windows .DRV

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drivers. It is hard to believe that Microsoft thinks this is a neat solution.

Also, even when running Word under Windows, Microsoft advises you to close a document in Word before looking at the same document with Pageview. This is slow and tedious.

Microsoft has sped up the scrolling of Word documents by using the time when a user is not entering text to 'pre-construct' the screens on either side of the one being displayed. Soon, more word-processing programs will use this otherwise wasted time for background processing.

On the plus side, Word 4 is probably the best word-processing package for producing desktop publishing quality output. Unlike any other word-processing package, it allows precise positioning of up to 64 fonts (in many different styles) to within one hundredth of an inch.

Sentinel Software, WordPerfect 5

WordPerfect 4.2 is the best-selling word-processing package in the world. It has tremendous capabilities for text processing and formatting at speed. To gild the lily, Sentinel has added powerful graphics integration modules for importing a variety of graphics formats, including Lotus PIC files, CGM metafiles, Windows Paint files, GemPaint files and more besides.

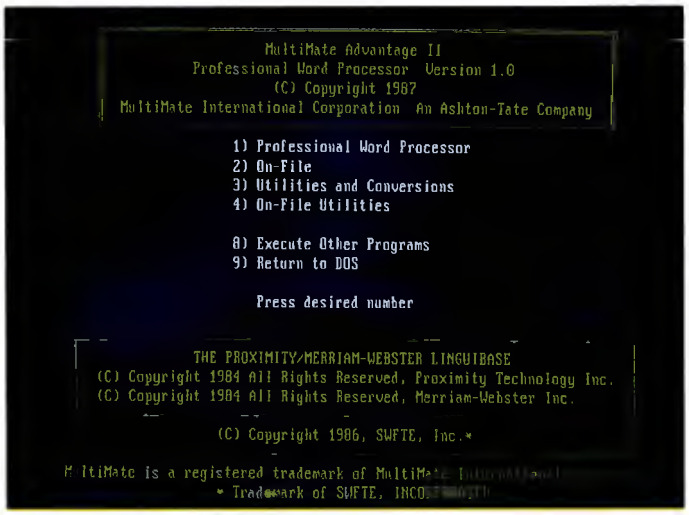
Once graphics have been imported, they can be sized and clipped before a border (of any width) and a title are added. A page preview function allows the user to see a rough approximation of the printout on screen.

Like Word 4, WordPerfect handles both newspaper-style columns and parallel columns with equal ease. However, WordPerfect scores over Word by displaying side-by-side columns on screen before using the page preview function.

Unlike its previous releases, and like Word 4, WordPerfect 5 uses absolute measurements to calculate the position of text and graphics. This is particularly useful with laser printers, where fonts of different sizes are mixed on the same page, and even on the same line.

With more documents being written by more than one person, the ability to see the changes made by others is very important. WordPerfect allows text to be formatted as 'hidden' so that it appears on screen but does not print out. Another feature — automatic deletion — compares the document on screen with one on disk and marks up the text according to the differences.

WordStar 2000 is MicroPro's attempt to produce a more powerful document-based word processor than its best-selling WordStar Professional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The claim to fame of MultiMate's Advantage is that it operates in the same manner as Wang's best-selling dedicated word processor

WordStar 2000 Plus, Release 3, Personal Edition

OK, MicroPro, you win the award for the program with the longest name. But for size, does WordStar's feature list match its name? It certainly does. This is a very powerful program, with a veritable bounty of facilities for the keen user. There's page preview, a dictionary, a huge thesaurus, telecommunications and extensive mailmerge (mail shot) capabilities. On the desktop publishing side, WordStar 2000 offers a page preview mode, and can incorporate graphics from other programs as well as Lotus 1-2-3 and Symphony.

Both the Hewlett-Packard LaserJet range, and the family of PostScript printers are supported. With MultiMate Advantage II, in joint first place in the printer support stakes, WordStar 2000 supports some 400 output devices!

But for all its fancy functions, WordStar looks as though it has been thrown together. It makes extensive use of 'overlays' to cope with the massive 8Mbytes of disk space that it gobbles up in its maximum configuration. (The minimum space occupied is 1.5Mbytes.) Whenever a major function is selected, the relevant overlay is brought in from disk to RAM, slowing things down.

Besides the major word processing functions, WordStar 2000 has two add-in applications — PC Outline and ShowText. PC Outline, an outline processor, helps you organise your thoughts — in theory. MicroPro should have included the outline processor as part of the program, rather than tacking it on as a (marketing) afterthought.

The other application, ShowText, has nothing to do with WordStar 2000 documents at all. It is a presentation graphics package, designed for producing large, high-quality characters on a variety of printers, including cheapish matrix printers. The best use for this program is for preparing overhead projector foils for seminars, and so on.

A terminate-and-stay-resident graphics program can be used to edit images captured from other programs, before they are included in a WordStar 2000 document.

MicroPro's software engineers have certainly paid some attention to speed. Expanded memory (LIM-EMS) is used to speed up block operations, and a technique called 'bookmarking' makes moving around a long document a pleasure.

MultiMate, Advantage II

In December 1985 Ashton-Tate took over MultiMate International, whose claim to fame was a PC word processor which acted in a similar style to the dedicated Wang word processors of the previous decade. The product was called MultiMate, and MultiMate Advantage II is the latest incarnation of this popular program.

You would expect mailmerge facilities from the world's largest supplier of PC database programs to be good, and they certainly are. A dBASE.DBF file can be merged to produce mail shots.

This is a high-end word processor aimed at company executives and the like. As such, it is superbly idiot proof. Most deleted material can be safely retrieved, long after it has been consigned to the bit-bucket in the sky.

The biggest criticisms levelled at MultiMate Advantage II relate to the 'page-oriented' design of the program. This means, among other things, that you cannot see two pages on screen at once, but the problem for Ashton-Tate is that the Wang dedicated word processor on which it is based is also fundamentally page-orientated.

Apart from the fact that it supports side-by-side columns, and comes with drivers for many printers (including laser printers), MultiMate Advantage II is no mean beast when it comes to page layout. Perhaps that's why Ashton-Tate chose to launch Byline, a true page layout program that works well with MultiMate Advantage II.

Conclusion

The areas of word processing and desktop publishing are slowly combining to produce fine productivity tools like WordPerfect 5. Unfortunately, there is just too little space here to do justice to the five packages reviewed — despite my criticisms — so the best advice is to see the programs in action and to speak to colleagues who use them.

There is one other top-end word processor that really should have been included in this review, but was omitted due to lack of space — Samna. Samna Plus IV Version 1.1 features all that you would expect — revision marking, outlining, sorting, and multiple on-screen columns. But it is a slow product, al-

Comparison of features

	DW4	WS2000+	MWord4	WP4.2	MMAII
Snaking columns	No	Yes	Yes	Yes	Yes
Single and snaking columns on same page	No	Yes	Yes	Yes	Yes
Maximum number of columns	No	3	19	24	8
Full justification and microjustification	No	Yes	Yes	Yes	Yes
Automatic calculation of placement and width	No	Yes	Yes	Yes	Yes
Side-by-side columns	Yes	No	Yes	Yes	Yes
Maximum number of columns	U	No	U	24	8
Full justification and microjustification	Yes	No	Yes	Yes	Yes
Unmatched column widths available	Yes	Yes	Yes	Yes	Yes
Adjustable gutter width	Yes	No	Yes	Yes	Yes
Single column automatically restored	No	Yes	Yes	Yes	Yes
Line graphics	Yes	Yes	Yes	Yes	Yes
Erasable line graphics	Yes	Yes	Yes	Yes	Yes
Dynamic graphics	No	No	Yes	No	No
Can import graphics files	No	Yes	*1	*2	No
Graphics preview	No	Yes	*1	*2	No
Page preview	No	Yes	*3	*2	Yes
High resolution monitor supported	No	Yes	Yes	Yes	No
Compatible with PageMaker	Yes	No	Yes	Yes	Yes
Compatible with Ventura Publisher	Yes	No	Yes	Yes	Yes
Cost	$1050	$700	$904	$787	$698

NOTES:
*1 With Pageview — provided free to registered users of Mirosoft Word 4
*2 To be included in WordPerfect 5.0
*3 Requires Microsoft Windows 2.0 or Microsoft Windows/386

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Benchmarks

Benchtests	DW4	WS2000+	MWord4	WP4.2	MMAII
File size (bytes)	64,512	54,706	50,176	50,000	53,760
Load (seconds)	5.00	1.50	1.00	1.00	2.00
Save and resume (seconds)	4.00	3.00	3.00	3.00	0.10
Search and replace (seconds)	18.00	5.70	6.00	6.00	9.00
Cursor top-to-middle (seconds)	3.00	0.10	0.10	0.10	1.00
Cursor middle-to-bottom (seconds)	2.00	0.10	2.00	0.10	2.00
Search for middle (seconds)	3.00	3.00	7.00	2.00	5.00
Block and Move (seconds)	6.00	1.10	0.10	0.10	6.00
Block and Copy (seconds)	11.00	2.50	N/A	1.00	6.00
Merge (seconds)	4.00	1.70	3.00	0.10	5.00
Text delete (seconds)	3.00	1.00	0.10	1.00	3.00
Print document (seconds)	63.00	67.00	35.00	2.00	155.00

though Version 2.0, which should be available soon, will address the issue of speed. Also, take a look at Lotus Manuscript 2, Q&A Write, XyWrite, PFS:Professional Write and Sprint.

Which would I recommend for people who need a high-end word processor which can produce desktop publishing-quality output? All five programs have a bolted-together feel, although some (WordPerfect 5) have less than others. On balance though, it's horses for courses. If you need connectivity with mainframe document composition packages, IBM's DisplayWrite 4 is the product to choose. For being the most idiot-proof, MultiMate Advantage II scores high marks. And for taking up seven subdirectories and 8Mbytes of disk space, WordStar 2000 deserves a commendation!

So in joint first place are Word 4 and WordPerfect 5. Word 4 has the edge with its fast semi-WYSIWYG display and powerful style sheets, even though its page preview functions leave something to be desired. For the purist, WordPerfect 5 has an unparalleled set of features that bring it closer to desktop publishing than any other.

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Good Show

Making the most of your business statistics means finding the best way of presenting them — gone are the days of the dusty flip chart, says Simon Jones.

Presentation graphics is a rather nebulous concept, embracing graphs and charts of business data, word charts, diagrams and pictures of all kinds. One of the more useful aspects of presentation graphics is being able to link lots of these graphs, charts and pictures into a sequence to show on a computer screen to fellow workers, the boss, sales staff or customers. The presenter would, in the old days, have used slides, overhead projectors, flip charts or storyboards. With a presentation graphics package on your computer, you can prepare your presentation faster and make it more interesting and understandable.

All presentation graphics packages are fairly complex to learn. This article looks at three of them. Davrelle from Soft Image Systems; Harvard Graphics from Software Publishing; and Storyboard Plus from IBM.

Many presentation graphics packages allow you to take data from your existing spreadsheet files and convert them into colourful graphs and charts. Some will allow you to add simple drawings to those charts. Others allow you to paint your own backgrounds or even capture paper-based artwork via a digitiser.

Davrelle, for instance, will read Lotus 1-2-3 spreadsheet files and files from packages which use the data interchange format. It will also take in images created with GEM Draw which can be used as backgrounds for the graphs and charts it creates.

IBM's Storyboard Plus will link to a digitising camera to allow company logos, pictures or photographs to be used as part of a presentation.

There are two sides to making a good presentation — the hardware and the software.

Davrelle gets its data for a chart from a live window onto a 1-2-3 format spreadsheet. Here, four spreadsheets' data have been incorporated into one presentation

Hardware and output devices

Before you buy your presentation graphics system, you should try to think of what you want to do with it and how you are going to use it to its best advantage.

There are fairly fundamental questions to be asked, such as 'How many people will a presentation be given to at any one time?'. This may seem a strange question at first but consider giving a presentation to 50 people with them all huddled round a 14in monitor. If your presentation is due in a week or so's time, then you might consider sending your work out to be converted into 35mm slides to show with an ordinary carousel projector and screen. That is very expensive if you have a lot of slides or give many presentations. It also means that your data is not secure, as an outside agency is involved. You can buy a slide printer and Polaroid 'Instant' slides bring the cost down considerably, but there is a corresponding reduction in the quality of the finished slides.

If your presentation needs to be up to date with data captured just hours or even minutes ago, or you do so many different presentations that 35mm slides are just too slow for you, the answer could be either a projection video system or an overhead projector. Both these devices can be hooked up to a computer and display large images of the computer screen. Both devices usually connect to the computer's standard video adaptor card.

The overhead projector option is usually a liquid crystal sheet which is laid on top of a normal projector. It is certainly

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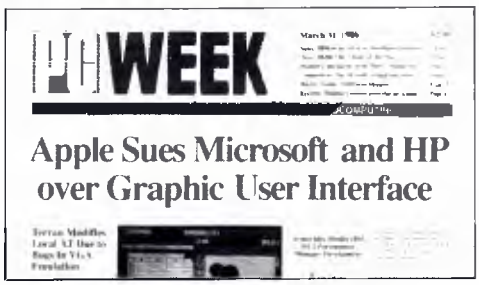

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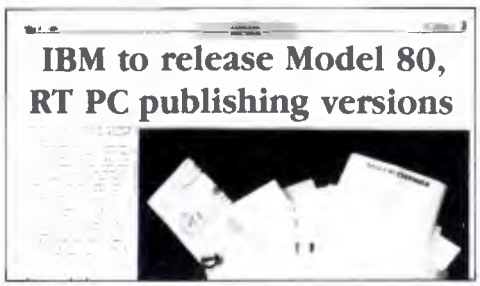

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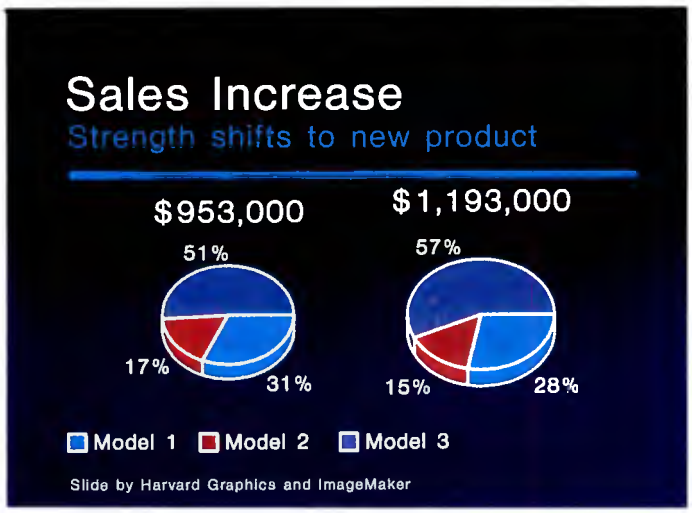

When used for colour printing or overhead projection, colour can be used to good effect.

light and portable but suffers from low resolution, low contrast, monochrome images. They are, however, getting better all the time and you should be able to get colour ones in the not too distant future. Sometimes these devices come with a remote control device which allows you to change the picture being shown without using the computer's keyboard.

Video projectors are large and expensive, and do not take kindly to being moved about. There are video projectors on the market which cope quite happily with the higher resolution enhanced graphics adaptor display modes, up to 640 x 350 in 16 colours out of 64. By the time you read this there will probably be projectors that will work at video graphics array resolution up to 640 x 480 in 16 colours out of 256,000 or 320 x 200 with 256 colours out of 256,000.

If you intend to produce printed output from your presentation graphics software, you will need to decide whether you require colour, and what sort of resolution you want. Most presentation graphics packages will print to a variety of dot matrix printers. IBM's Graphics Printer and Epson's FX series are popular choices, closely followed by Epson's 24-pin LQ series and its imitators.

The greater resolution and speed of the 24-pin printers are really needed to do justice to the images from the software. Laser printers can produce quite acceptable results, but some will not be able to cope with the sheer size of the bit images needed to produce a full page. You may be able to upgrade the memory capacity of your laser printer so that it can produce full-page printouts of your graphs and charts. Pages from either dot matrix or laser printers can be photocopied on to overhead projector acetate film in any modern photocopier.

Some presentation graphics packages allow you to use colour dot matrix printers. These can produce acceptable results although they are often slow and expensive to run. You may also find a mismatch between the colours you see on the screen and the colour that appears on the paper. Again, see the printer working with your software before you buy.

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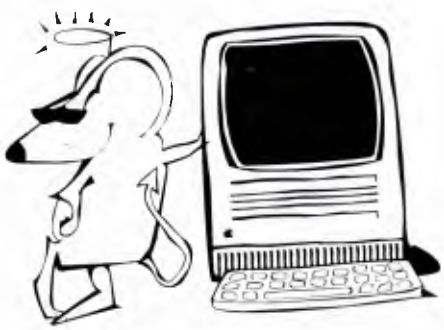

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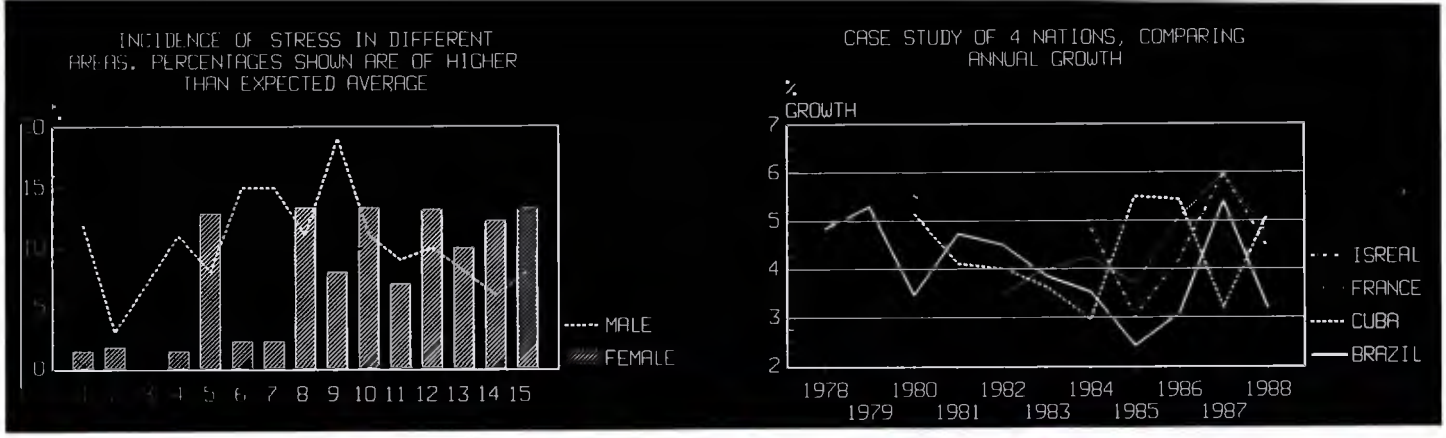

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CSS: Fast hierarchical menus; the entire user interface is optimised to limit the number of keystrokes necessary to perform an analysis; fast selection of individual variables or lists of variables; previous variable selections are "remembered" (and can be edited) across consecutive analyses; batch processing is also supported.	**SPSS/pc +**. Command language, some commands are several lines long (in case of a typo, e.g., a misspelled variable label, the entire command has to be re-typed); commands can also be submitted via batch files.
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CSS: Flexible; all display formats are dynamically adjusted to yield maximum display precision while preserving compatibility of formats within columns of numbers; special extended formats are available where applicable (B-weight = .094027563759532)	**SPSS/pc +** Fixed, regardless of value (e.g., if values are very small, SPSS cannot display them with sufficient precision)
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CSS: Selective printing or saving of results (e.g., only specified tables with results, or subsets of tables); all results can also be automatically printed (or saved) in formatted reports; graphics can be printed on all plotters, dot matrix, colour, and laser printers (including printers supporting PostScript)	**SPSS/pc +** Only via dumping all screen output from an analysis to the printer or file; hi-res graphics are not available,
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CSS: In addition to matrices (corr., cov. etc.) and scores that are calculated for each case (e.g., residuals, factor scores), all other numbers generated with CSS analyses can be converted into the CSS data file format	**SPSS/pc +** Only matrices (corr., cov. etc.) and scores that are calculated for each case (e.g., residuals)

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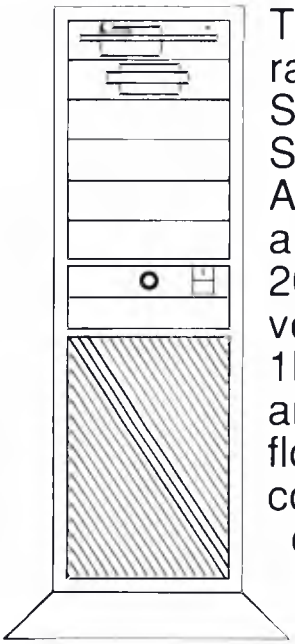

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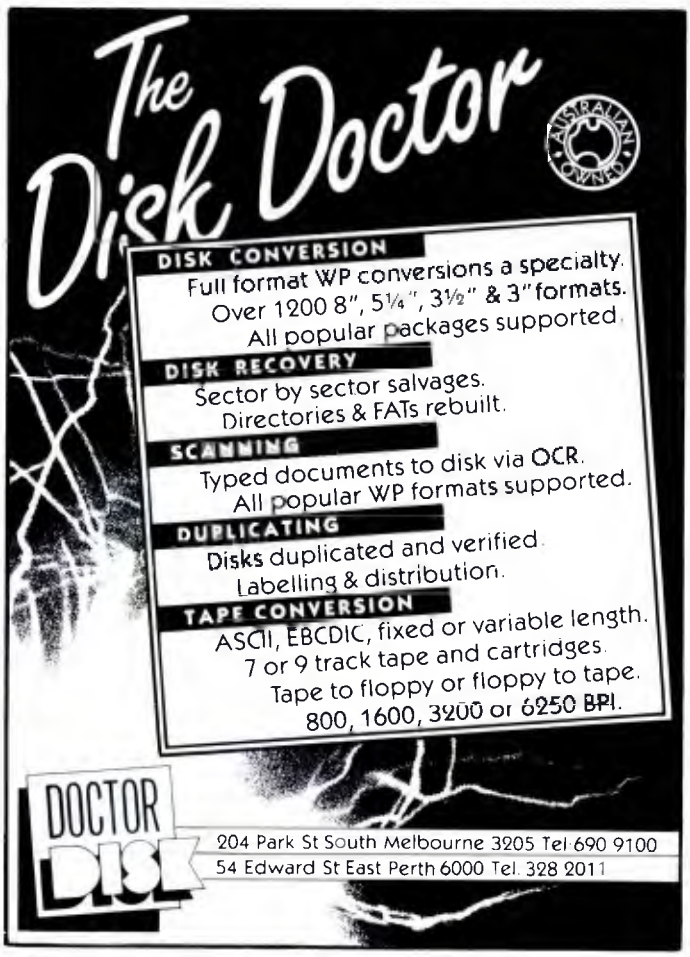
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The computer you use to run your presentation graphics software will almost certainly have to be an 80286 or 80386-based AT compatible with at least 640k of memory. You could try using an ordinary 8088 or 8086-based PC but you wouldn't get very far. The computations involved in manipulating graphic images are so complex that a PC just isn't powerful enough to get the job done in a reasonable time. While some packages claim to allow you to work with just twin floppy disk drives, you will need a hard disk drive if you are going to make any significant use of presentation graphics. The larger the better, of course, but don't overstretch your budget for storage and forget to allow for a display card and monitor.

You can get away with a Hercules compatible monochrome card and mono monitor if you have to. If you are using only black and white images for your final presentation on paper or overhead projector, then that is all you need. On the other hand, coloured images stand out much more and convey meaning more easily. For good colour images you will need an EGA card and compatible monitor. Some presentation graphics packages offer VGA compatibility with its enhanced resolution and greater range of colours, but VGA is still an expensive luxury for most people.

For all but the simplest charts you will want to point at objects on the screen. Virtually all presentation graphics packages allow you to use the cursor keys to do this, but they are fiddly and very slow. You should certainly have a mouse for packages that run in a WIMP environment. Davrelle, which runs under GEM, is one example. Picking and dragging your graph into the right place on the screen is far easier with a proper pointing device (for instance a mouse). Make sure, though, that the package you are thinking of buying will support your mouse.

Using a presentation graphics package

How do you go about using a typical presentation graphics package? Any presentation is a collection of slides, so you start by designing those slides. You may read in data from existing spreadsheet files, or use the package's data editor to create new figures and the legends that are to go on the X and Y axes (or label a pie chart). For example:

Sales $M	Jan	Feb	Mar	Apr	May	June
Telecomms	6.2	4.5	6.8	7.2	6.9	7.5
Plastics	3.5	4.0	3.9	3.8	4.1	4.4
Transport	4.2	4.5	4.1	4.6	4.4	4.8

Next, you would decide how you wanted to graph the data. You might decide on a bar chart with vertical bars grouped in threes for each month. You would choose the colours of the bars — say red, green and blue — and tell the package to make the bars three-dimensional. Choose a white background and tell the computer to plot the result, and up comes a picture of your data.

The graph or titles might not be quite in the right place, so you would point with the mouse to the section you wanted to move and drag it across the screen until you were happy with it. You could now change the colours of the bars, background, legends, and so on, until you were satisfied with the effect. If the package you were working with allowed, you could pick suitable symbols or icons to illustrate the graph. The package would show a list of groups of icons for you to choose from. You choose the business symbols and the computer shows you a page full of small pictures representing bank notes, envelopes, satellite dishes, lorries, chemical flasks, computers, factories, oil wells, and so on.

Pointing to the satellite dish and pressing a button on the mouse, you pick up a copy of that icon and put it into your bar chart next to the telecomms legend. Similar operations bring a lorry and a chemical flask on to the slide. If, at this late stage, you decide that you want a line or graph, then it is no problem. The chart style can be changed at any time without having to re-type your data. All the other attributes (colours, legends, and so on) will remain the same.

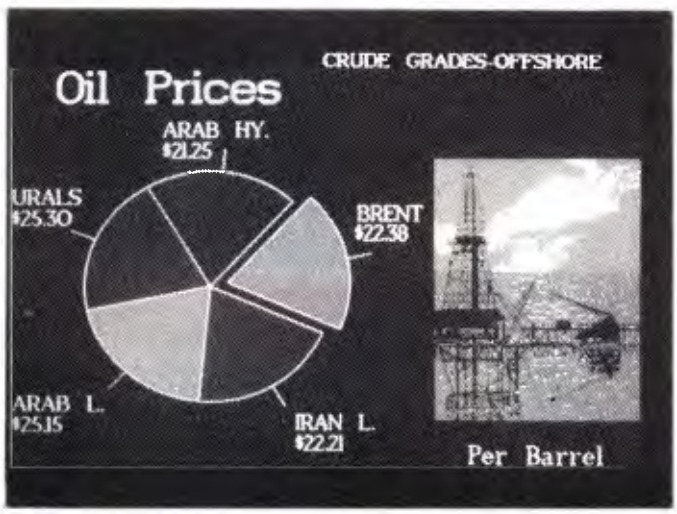
When you are happy with your slide, you can save it and move on to the next. This one may be a word chart. For example:

Next Quarter

- Forecast Sales up 25 per cent
- Forecast Profits up 15 per cent
- Next Marketing Target — Japan

After selecting the type style, size and colour, you would type these words at the keyboard and the characters would be drawn large on the screen. The bullet points, the '•' characters, could be put in later and you could play around with the colour scheme, size and style of text as you wished. You could even add a map of Japan if you wanted to.

When you have finished your slides,



Some presentation packages allow for a wide variety of chart styles. Not all packages provide 3D charts, but graphics can be enhanced with drawing facilities

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- Size 200(W) x 68(H) x 150(D)mm

Cat X19110 **R.R.P. $169**
Our Price $149

2 & 4 WAY RS232 DATA TRANSFER SWITCHES

If you have two or four compatible devices that need to share a third or fifth, then these inexpensive data transfer switches will save you the time and hassle of constantly changing cables and leads around

- No power required
- Speed and code transparent
- Two/Four position rotary switch on front panel
- Three/Five interface connections on rear panel
- Switch comes standard with female connector

2 WAY Cat X19120 **only $59**
4 WAY Cat X19125 **only $99**

2 & 4 WAY CENTRONICS DATA TRANSFER SWITCHES

Save time and hassles of constantly changing cables and leads around with these inexpensive data transfer switches. These data switches support the 36 pin centronic interface used by Centronics, Printronics, Data Products, Epson, Micronics, Star, and many other printer manufacturers

- No power required
- Speed and code transparent
- Two/Four position rotary switch on front panel
- Three/Five interface connections on rear panel
- Switch comes standard with female connector
- Bale locks are standard

2 WAY (X19130) **only $59**
4 WAY (X19135) **only $99**

THE BUTTON SPIKE PROTECTOR

Surges and spikes are caused not only by lightning strikes and load switching but also by other equipment being switched on and off, such as fluorescent lights, electric motors, fridge freezers, air conditioners, etc

For effective protection such spikes must be stopped before they reach your equipment. Simply plug The Button into an outlet and it will protect all equipment plugged into adjacent outlets on the same branch circuit. The Button employs unique metal oxide varister technology and will dissipate 150 joules of electrical energy (nearly twice that of comparable surge arresters.)

SPECIFICATIONS:
Voltage: 240V Nominal
Total Energy Rating: 150 joules
Response Time: 10ns
Protection Level: 350V peak
..... **$34.95**

COMPUTER PAPER

Quality paper at a low price! 2 000 sheets of 70 gsm bond paper

Cat C21003 11 x 9½" **$39.95**
Cat C21005 15 x 11" **$67.95**

CPF CONTINUOUS POWER FILTER SPIKE ARRESTOR

The Fortron CPF Filtered Electronic Spike Protector provides a protective electronic barrier for microcomputers, printers, telephone systems and modems, electronic typewriters, audio and stereo systems and other sensitive electronic equipment

The CPF provides protection from dangerous electrical spikes that can cause anything from obvious damage (like immediate equipment failure) to less obvious harm that can drastically shorten a system's life

CPF's superior circuitry design and semi conductor technology responds instantly to any potentially damaging over-voltage, ensuring safe trouble free operation

Additionally, CPF's filtering capability helps eliminate troublesome and annoying interference, general hash created by small motors, fluorescent lamps, and the like that threaten the performance and shorten equipment life of unprotected electronic components

SPECIFICATIONS:
Electrical rating: 220-260 volts (AC) 50Hz 10 Amp
Spike/RFI Protection: 4,500 amps for 20m/second pulses
Maximum clamping voltage: 275V differential mode
Cat X10088 **$69.95**

COPY HOLDER (YU-H33)

- Copy area 9½" x 11"
- Sliding line guide
- Flat metal base

C21060 **$39.95**

3½" EXTERNAL DRIVE

- 720K formatted capacity
- 37 way D type connector fits directly onto drive controller card
- Compatible with IBM* PC/XT
- Requires DOS 3.2 or greater
- Size 266(D) x 104(W) x 75(H)mm

..... **only $395**

APPLE* COMPATIBLE SLIMLINE DISK DRIVE

Compatible with Apple 2+
Cat X19901 Normally $225
SPECIAL $179

APPLE* IIC COMPATIBLE DISK DRIVE

Including cable **only $199**
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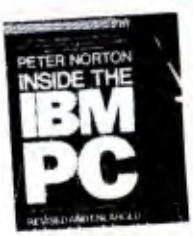

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B20080 **$44.95**

RS232 BREAK OUT BOX

A simple way of monitoring RS232 interface lead activity. Interface powered, pocket size for circuit testing, monitoring and patching. 10 signal powered LED's and 2 spares. 24 switches enables you to break out circuits or reconfigure and patch any or all the 24 active positions

SPECIFICATIONS:
Connectors: DB25 plug on 80mm ribbon cable and DB25 socket
Indicators: Tricolour LED's for TD RD, RTS CTS, DSR CD, TC RC, DTR (E)TC
Jumper Wires: 20 tinned end pieces
Power: Interface power
Enclosure: Black, high impact plastic
Dimensions: 85 x 95 x 30mm

X15700 ..... **$94.95**

RS232 FAST CABLER

Makes RS232 interface configuring fast and simple. 3 slide switches enable line swapping functions positive and negative voltages are displayed on 6 tricolour LED's

SPECIFICATIONS:
Connector: DB25 plug on 100mm cable and DB25 socket on 100mm cable
Indicators: Tricolour LED's for pins 2(TD), 3(RD), 4(RTS), 5(CTS) 6(DSR), 20(DTR)
Switches: 3 Slide switches to swap leads
Power: Interface power
Enclosure: Black, high impact plastic
Dimensions: 85 x 95 x 30mm

X15710 ..... **$145**

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DESCRIPTION	1-9 BOXES	10+ BOXES
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5¼" 2S/2D	$13.95	$12.95
5¼" 2S/HD	$29.95	$27.95

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Cat C14205 **$39.95**

APPLE* II SERIES COMPATIBLE JOYSTICK

These joysticks have adaptor connectors to suit the Apple II IIc IIe and II+ computers Features include selectable spring centring or free floating Electrical trim adjustments on both axis 360° cursor control and dual fire buttons

Cat C14201 **only $39.95**

9 PIN TO 25 PIN CONNECTOR ADAPTORS

NEW! The ideal solution! Features gold plated pins

X15668 DB9 Plug to DB25 Socket
X15669 DB9 Socket to DB25 Plug
each $10.95

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- Australian plug to U.S. socket
- Length 10cm

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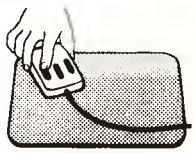

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- A quality mouse mat for accurate and comfortable tracking
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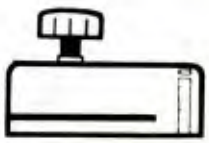
- 265 x 225mm

C21075 ..... **$14.95**



DISK NOTCHER

Converts 5¼" single sided floppy disks to double sided by placing an appropiate notch in the floppy disk jacket

C21070 **$9.95**

RS232 WIRING ADAPTOR BOX

- Male to female
- 25 Detachable plug on leads
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Only $44.95

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(ALL PRICES PER 10 DISKS)

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5¼" DISK STORAGE (DD100-L)

Efficient and practical. Protect your disks from being damaged or lost!

Features:
- 100 x 5¼" disk capacity
- Smoked plastic hinged lid
- Lockable (2 keys supplied)
- High impact ABS plastic base
- Contemporary design

C16020 **only $15.95**

JUMBO 5¼" DISK STORAGE (DD120-L)

If you have lots of disks you'll appreciate the extra capacity of this disk storage unit when it comes to locating a particular disk

Features:
- 120 x 5¼" disk capacity
- Smoked plastic hinged lid
- Lockable (2 keys supplied)
- High impact plastic base

C16028 **only $19.95**

3½" DISK STORAGE (DD80-L)

- Holds up to 80 x 3½" diskettes
- Smoked plastic hinged lid
- Lockable (2 keys supplied)
- High impact plastic base
- Contemporary design

Cat C16038 **only $19.95**

3½" DISK STORAGE

- Holds up to 40 x 3½" diskettes
- Lockable (2 keys supplied)
- High impact plastic lid and base

Cat C16035 **only $14.95**

HEAD CLEANER DISKS

It only takes a minute amount of dust dirt or magnetic oxide particles on your drive heads to cause problems errors downtime or an expensive service call Regular use of a head cleaner will keep your drive free of trouble causing dirt and help keep your system up and running These disk cleaners are simple to use and include cleaning solution and instructions

CAT No	SIZE	PRICE
C12560	3½"	$6.95
C12555	5¼"	$6.95

THOMSON EGA MONITOR

Top quality high resolution EGA monitors with a space-age design

SPECIFICATIONS:
CRT: 14 inch (360mm) diagonal 90 degree deflection
Display Size: 245(H) x 180(V)mm
Phosphor: P22, non glare, tinted screen
Dot Pitch: 0.38mm
Video Bandwidth: 18 MHz
Resolution: 15.75KHz - 640 x 200 21.85KHz 640 x 350
Input Signals:
1. RGBI positive H(+) V(+)
2. RrGgBb positive H(+) V(+)
Input Impedance: TTL Level (330 ohms)
Dual Scanning Frequency:
Horizontal: 15.75 KHz or 21.85 KHz ± 10Hz
Vertical: 50 - 60 Hz
Connector: 9 pin D-type
Size: 312(H) x 363(L) x 380(W)mm
Weight: 10.8 Kg (Net)

X14525 ..... **$695**

SAKATA 13" RGB COLOUR MONITOR

High quality IBM* compatible monitors, great with VCR's too!

SPECIFICATIONS:
CRT: 13" 90° deflection colour
Input Signal:
Video Signal: Separate video signal
Video: Positive
Sync: Positive
Input Level: TTL Level
Scanning Frequency:
Horizontal: 15.7KHz
Vertical: 60Hz
Display Size: 245(H) x 182(V)mm
Resolution:
Horizontal: 640 dots
Vertical: 200 lines
Size: 343(H) x 362(W) x 421(D)mm
Weight: 11.6kg

Cat X14530 **$695**

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- Three buttons user definable. Get the maximum selective features possible by having a third button choice
- A specially silicone coated steel ball transfers mouse movement to internal motion encoders without the need of a special surface. Smooth gliding over any hard even surface
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- Maximum tracking speed 200m/sec
- Mouse resident firmware
- Auto repeat key
- 1.5 metre lead
- DB25 socket connector
- Weight 212 grams
- Size 116 x 66 x 34mm

Cat X19950 ..... **$59.00**

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$29·95ea	$27·95ea	$26·95ea

(ALL PRICES PER 10 DISKS. TAX EXEMPT PRICES LESS $1)

3½" 2S/2D "NO BRAND" DISKS

10+ DISKS	100+ DISKS	1,000+ DISKS
$29	$27	$25

(ALL PRICES PER 10 DISKS. TAX EXEMPT PRICES LESS $2)

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you can build them into a presentation. A different area of the package deals with this. It asks you for the names of the slide you want to display. Each slide on the list will have a number of attributes set for it. These could include a special display effect (replacing, sliding, dissolving, wiping) or a time delay telling the computer to show this slide for 15 seconds before showing the next one. You might want to set up a display with branches so that the person giving the presentation could skip sections or show parts of it again or in a different order.

This would be done by telling the computer to read the keyboard and branch to different slides depending on what key was pressed. This gives the possibility of creating interactive learning packages, with some slides asking questions and the computer branching to the next section if the user answers correctly, or repeating the current section if they get it wrong.

While you are putting the slides in order, you can run the presentation at any time to see how it will look.

If you are going to give your presentation using projector acetate film or 35mm slides, you will need to create these 'hard copies'. The acetates you might print directly to a laser printer. For 35mm slides you would either send away a floppy disk containing the presentation files to be processed by a bureau service, or you would hook up your film recording device (Polaroid Palette for instance) and tell the computer to dump the presentation to that device. (You could have a cup of tea while the slides are produced.) A Polaroid Palette uses 'instant' 35mm slides so it takes minutes to have a complete presentation ready to run. Unfortunately, you can't do any special effects (animation or fancy 'wipes') for output on acetate or 35mm slides.

A completed presentation can be stored, along with all its slides, on floppy disks so that you can give it to colleagues who have the same presentation graphics software as yours. (They might not have exactly the same hardware but that should not matter a great deal.)

What happens if you want to give the same presentation as you gave last month but you want it to show this month's figures? Some presentation graphics packages allow you to tie slides to real data files so that, if you change the data in the spreadsheet file, there is little or no work to do to see the new graph. This means you have to be exceptionally careful about keeping your files in order. If you absent-mindedly delete the data file, any presenta-

Comparison of features

	Harvard	Davrelle	Storyboard Plus
Word charts	Yes	Yes	Yes
Organisations charts	Yes	No	Yes
Pie charts	Yes	Yes	Yes
Bar charts	Yes	Yes	Yes
Area graphs	Yes	No	No
Line graphs	Yes	Yes	Yes
Curves	Yes	No	No
Scatter graphs	Yes	No	No
Hi-low close charts	Yes	No	No
Logarithmic charts	Yes	No	No
2D	Yes	Yes	Yes
3D	Yes	Yes	No
Paint routine	Yes	No	Yes
Draw routine	Yes	No	No
Symbol library	Yes	No	Yes
Font library	6	2	6
Background library	No	Yes	No
Maps — US	Yes	No	Yes
— Europe	Yes	No	Yes
— Australia	Yes	Yes	No
— World	Yes	No	Yes
— Cities	Yes	No	Yes
Graphic — Hercules	Yes	Yes	No
— CGA	Yes	Yes	Yes
— EGA	Yes	Yes	Yes
— VGA	Yes	? (GEM)	Yes
Printers — 9-pin	Yes	Yes	Yes
— 24-pin	Yes	? (GEM)	Yes
— Colour	Yes	? (GEM)	Yes
— Laser	Yes	Yes	Yes
Plotters	Yes	Yes	No
35mm slide cameras	Yes	Yes	No
Mouse	Yes	Yes	Yes
Graphics tablet	Yes	Yes	No
Video digitiser	No	No	Yes
Import from — Lotus 1-2-3	Yes	Yes	No
— Symphony	Yes	Yes	No
— SLK files	No	No	No
— DIF files	No	Yes	No
— PFS	Yes	No	No
— ASCII	Yes	Yes	No
— GEM Draw	No	Yes	No
Screen capture	No	No	Yes
Export to — PFS	Yes	No	No
— CGM Metafiles	Yes	Yes	No
— DIF files	No	No	No
— TIFF (PageMaker)	No	No	No
— EPS (Ventura)	Yes	No	No
— GEM (Ventura)	No	Yes	No
Auto update from data files	Yes	Yes	No
Animation	No	No	?
Wipes/special effects	Yes	No	Yes
Music	No	No	Yes
Voice	No	No	Yes
Interactive show	Yes	Yes	Yes
Rolling show	Yes	Yes	Yes

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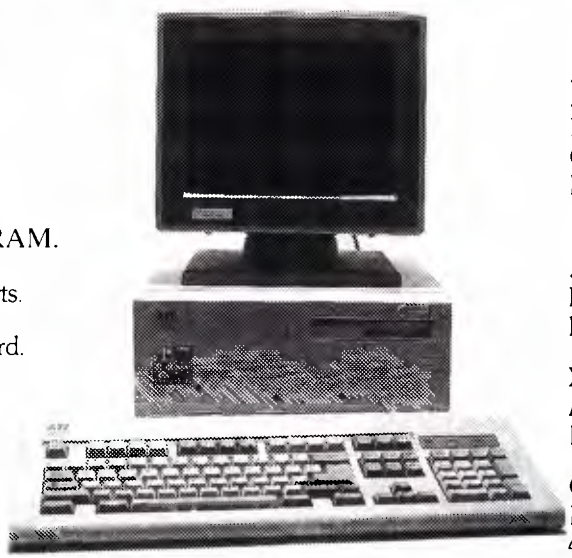

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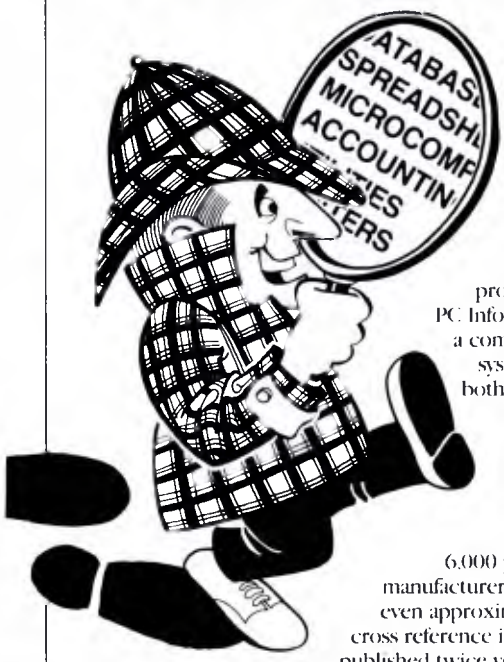

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tion which uses that slide will no longer work.

The main contenders

Of the three main contenders for your money, none of them does everything. Harvard has more features than Davrelle or Storyboard Plus but it is also harder to learn. Harvard lends itself to heavy users of presentation graphics, being able to create slide templates — very useful if you create many slides of the same type.

Harvard and Storyboard Plus have extensive libraries of images, symbols, maps, and so on. Storyboard Plus loses out, though, because it has only a meagre number of chart types and no vector graphics. All the images in Storyboard are bit-mapped and will not enlarge very well. Storyboard does, however, have good text and painting facilities.

Davrelle gives you a lot of functions that are fairly easy to learn, although it doesn't conform to some of GEM's standards. If you already use GEM, however, then this is an obvious choice. I found Davrelle quite good at simple things but it does not have any painting or drawing functions. If you want anything other than basic features such as graphs, charts or words you will have to import them from other GEM-based packages. In the end, you pays your money and you takes your choice. Ask your dealer to show you one or two packages in action before deciding. You could take some of your data along to try out, or show the dealer one of your existing slides and ask him to reproduce it using a presentation graphics package.

If you do decide to buy a presentation graphics package, take your time to learn all about it. The more familiar you are with it, the better your presentations will be.

END

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Davrelle	MicroAustralia, 15 McDonald St, Mortlake 2137. Tel: (02) 736 3299
Harvard	Imagineering, 77 Dunning Ave, Rosebery 2018, Tel: (02) 697 8666
Storyboard Plus	IBM Australia. PO Box 4789. Sydney 2001. Tel: (02) 634 9111.

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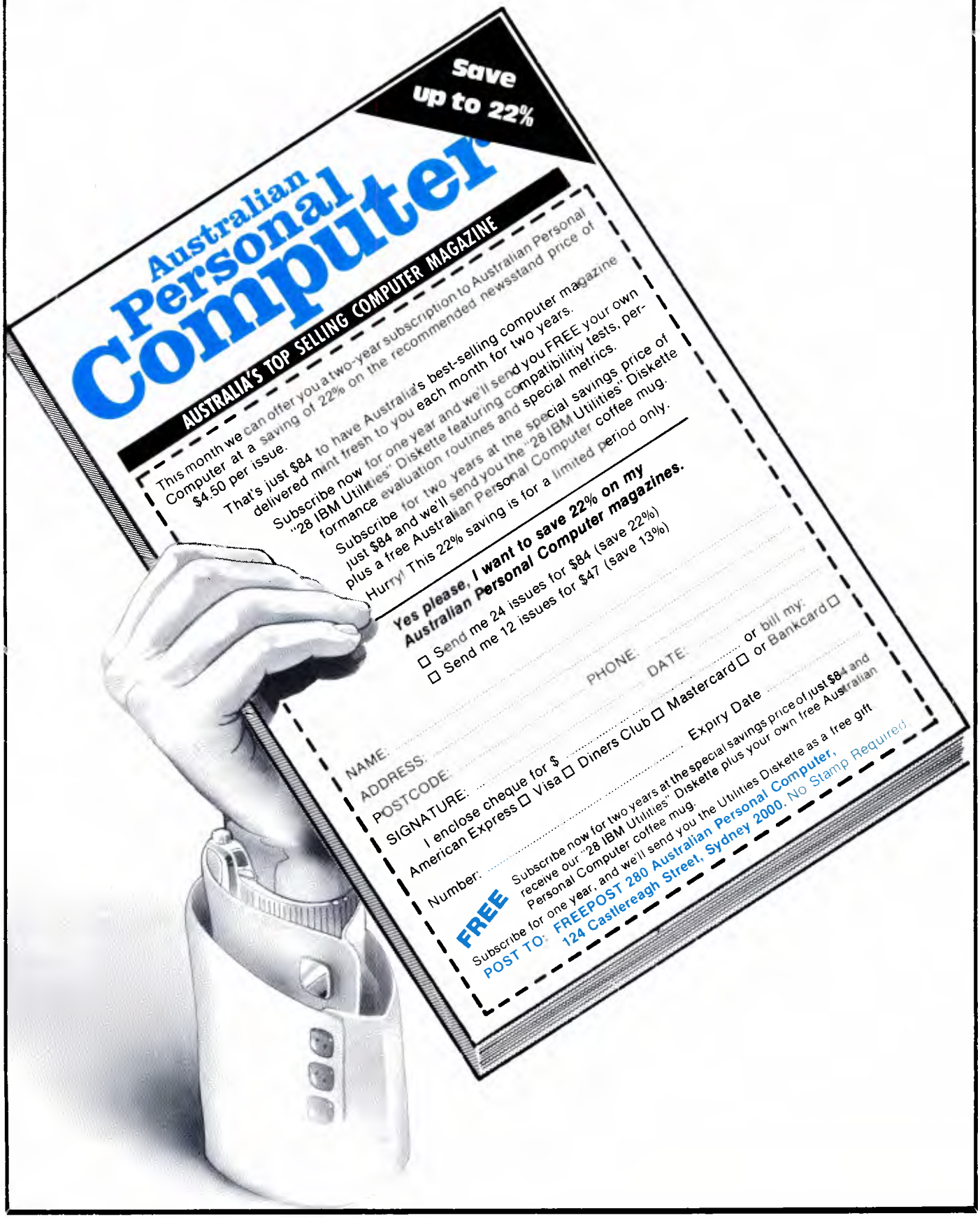
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Putting an end to hotkey hassles

When your memory-resident utilities or your macros conflict with the keystrokes you need for your applications, you've got a problem. With ALLKEYS you've got the answer.

Pop-up utilities, which put everything from calculators to file managers at the touch of a key, have become an essential part of using the PC efficiently. If you share my addiction to pop-ups, however, you've probably also experienced my nightmare. While trying to insert a line of text with your word processor, you suddenly find you've brought up an on-screen notepad instead. With only a limited number of key combinations available, the hotkeys used by your memory-resident utilities often coincide with the keystrokes needed by your regular applications.

The more often you've edited your AUTOEXEC.BAT file to exclude or include your pop-ups, the more you'll appreciate ALLKEYS. ALLKEYS.COM is a TSR (Terminate-and-Stay-Resident) program that lets you instantly disable or enable the hotkeys used by your other memory-resident programs. When you want them, your TSR utilities are there, loaded as usual. When their operation would interfere with your application, you simply toggle them off, leaving them dormant. Toggle ALLKEYS again and your hotkeys become hot again, restoring your pop-ups to life.

ALLKEYS can be especially useful if you use RAM-resident keyboard macro programs such as SuperKey. If you find that the keys to which you're assigning your macros sometimes conflict with your applications, simply use ALLKEYS to toggle them off and on again. In addition, when you run out of infrequently used keys for macros, you can make use of normal, A-Z keys, using ALLKEYS to toggle them between their regular and macro use.

ALLKEYS.COM is available for downloading through Microtex *6663# on Telecom's Viatel; or by sending a blank formatted 5.25in disk with a stamped, self-addressed package to ALLKEYS, C/- *APC*, 124 Castlereagh Street, Sydney 2000. The assembly language source code, ALLKEYS.ASM, is printed here, as is ALLKEYS.BAS, a Basic program that will automatically create ALLKEYS.COM. The .ASM and .BAS files for ALLKEYS are also available via Microtex or on disk.

To use ALLKEYS, you must load it both before and after the group of pop-ups whose hotkeys you want to control. While you can do this from the DOS prompt, the easiest way to use ALLKEYS is to include its two entries in your AUTOEXEC.BAT file, thus:

```
[d:][path]ALLKEYS
POP-UP #1
POP-UP #2
POP-UP #3
...
[d:][path]ALLKEYS
```

To toggle ALLKEYS' action, just press Ctrl-Alt-Z at any time. ALLKEYS confirms its new on/off status by sending a short sequence of beeps through the speaker. ALLKEYS is on (and the controlled TSRs are off) if the beeps increase in pitch; if the beeps get lower, the reverse state is in effect. When initially loaded, ALLKEYS defaults to off, which means that your pop-ups operate normally.

Those RAM-resident utilities that you *don't* want toggled off and on should be placed outside ALLKEYS' boundaries. These might include a keyboard enhancement utility such as QUICKEYS, which speeds up your keyboard's typematic action.

At any time after its initial loading, you can uninstall ALLKEYS by entering

```
ALLKEYS /U
```

This is useful if you want to load another copy of ALLKEYS to use with a different set of pop-ups. When entered with the /U parameter, ALLKEYS attempts to uninstall and remove itself completely from memory. If successful, the message 'ALLKEYS uninstalled' is displayed. However, if additional pop-ups were loaded after ALLKEYS was installed (or you use SideKick), ALLKEYS will only disable itself. This has the same practical effect as complete uninstallation, though ALLKEYS still remains in memory (it occupies just over 800 bytes of RAM). When this happens, the message 'Vectors could not be restored — ALLKEYS disabled' will be displayed.

Inside ALLKEYS

When a .COM format program is loaded, DOS assigns all available memory to it. Normally, the program will perform its function and then exit back to DOS, releasing all its allocated memory for use by the next program. Pop-ups, on the

other hand, need to remain in some of this memory so that they *won't* be overwritten by the next program. DOS provides a TSR function that allows programs to do this.

When a program uses this function, it must specify how much memory should be permanently removed from the memory pool. DOS thereafter considers that reserved memory as an extension of itself, so it will not be overlaid when other programs are subsequently loaded. A dormant program that just sat in memory, though, would only waste RAM. Thus, pop-ups must incorporate some mechanism — a trigger key — that will pop them up.

Every time a key is pressed or released, the keyboard generates an interrupt 9 which instructs the CPU (Central Processing Unit) to call a routine whose address is stored in a table in low memory. Normally, this address points to the BIOS (Basic Input/Output System) keyboard handler. This is a routine in ROM (Read-Only Memory) that translates the scan code sent from the keyboard into ASCII and then deposits it in the keyboard buffer.

To check for their hotkeys, most pop-ups save the current interrupt 9 address (vector) and substitute the address of their new keyboard handler. This is usually done either directly or by using DOS interrupt 21h functions 25h (Set Interrupt Vector) and 35h (Get Interrupt Vector). Then, when an interrupt 9 is generated, the pop-up can check to see if its designated hotkey has been pressed before it passes the keystroke on to the BIOS. If more than one pop-up has been loaded, the last loaded is the first to check for its hotkey. If the key pressed was not its own trigger key, the pop-up transfers control to the one loaded before it. The checking process is then repeated until finally the BIOS gets the keystroke.

To pick up their keystrokes, applications normally call BIOS interrupt 16h. (Some applications, like DOS's EDLIN program, use DOS interrupt 21h instead, but ultimately interrupt 16h is invoked in any case.) Interrupt 16h provides three functions to the applications: function 0 (Read Next Keyboard Character); function 1 (Report Whether Character Ready); and function 2 (Get Shift Status). By intercepting interrupt 16h, pop-ups gain an alternative mechanism for telling when their hotkeys are pressed. When an application calls this interrupt requesting a key, the pop-up can make its own check first.

In terms of toggling itself on and off, ALLKEYS does much the same thing as other pop-ups. Its main objective, however, is to sneak keystrokes past the whole pop-up chain. To do this ALLKEYS needs the original interrupt 9 and 16h vectors — the ones in effect before the pop-ups were loaded. Then, when a key is pressed (interrupt 9) or requested (interrupt 16h), ALLKEYS can simply jump to the original interrupt routine, thus skipping all the pop-ups in between. An example may help you picture exactly how this works.

```
;-----------------------------------------------------------------------
; Allkeys- Returns popup stolen key combinations back to the applications
;          Load "ALLKEYS" before and after your pop-ups.
;          Then press Ctrl-Alt-Z to toggle ALLKEYS on/off.
;          "beep. BEEP" signals all keys on. "BEEP..beep" signals all keys off.
;-----------------------------------------------------------------------
CSEG        SEGMENT   PARA PUBLIC 'CODE'
            ASSUME    CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG
            ORG       100H

FIRST:      JMP       INIT

COPYRIGHT   DB    "ALLKEYS 1.0 (c) 1988 Ziff Communications Co.",13,10
            DB    "PC Magazine ",254," Robert L. Morton",13,10
            DB    'Low copy installed",13,10,"$"

MESG1       DB    "ALLKEYS high copy installed",13,10
            DB    "Ctrl-Alt-Z to toggle tasks on/off",13,10,"$"

MESG2       DB    "ALLKEYS already installed high and low",13,10,"$"

MESG3       DB    "Vectors could not be restored - ALLKEYS disabled",13,10, '$'

MESG4       DB    "ALLKEYS not loaded yet",13,10,"$"

MESG5       DB    'ALLKEYS un-installed",13,10, $"

ORIG_INT9   DW    0,0               ;The original int 9 vector
ORIG_INT16  DW    0,0               ;The original int 16h vector

USED_INT9   DW    0,0               ;The used int 9 vector
USED_INT16  DW    0,0               ;The used int 16h vector

HOTKEY      DB    44                ;Our HOT key: 'Z'
SHIFT_MASK  DB    0CH               ;Our shift mask: 'Ctrl-Alt'

ALLKEYS     DB    0                 ;Allkeys on/off status flag

DISABLE     DB    0                 ;If set to 1, Allkeys will not respond
                                    ;  to Ctrl-Alt-Z combination and all
                                    ;  keystrokes will be processed normally.

TONE_LOW    DW    500               ;Low boundary "beep"
TONE_HIGH   DW    1500              ;High boundary "BEEP"
TONE_STEP   DW    500               ;Step between tones
TONE_LENGTH DW    50                ;Length of each tone
;-----------------------------------------------------------------------
; New interrupt 9 handling routine.
;-----------------------------------------------------------------------
NEW_INT9    PROC      NEAR
            ASSUME    CS:CSEG, DS:NOTHING, ES:NOTHING, SS:NOTHING

            STI                                 ;Enable interrupts
            PUSH      AX                        ;Save AX

            CMP       CS:DISABLE,0              ;Are we disabled?
            JNE       KB1                       ;Jump out if so.

            IN        AL,60H                    ;Get key just pressed
            CMP       AL,CS:HOTKEY              ;Was it our HOT key?
            JNE       KB2                       ;If not, jump KB2

            MOV       AH,2                      ;Get shift status
            INT       16H
            AND       AL,0FH                    ;Mask out shift keys
            CMP       AL,CS:SHIFT_MASK          ;Was it our shift mask?
            JNE       KB2                       ;If not, jump KB2
            CALL      KB_RESET                  ;Reset keyboard

            XOR       CS:ALLKEYS,0FFH           ;Toggle request flag
            CALL      BEEP_STATUS               ;Beep Allkeys status

KB1:        POP       AX                        ;Restore AX
            JMP       DWORD PTR CS:USED_INT9    ;Exit through popup chain

KB2:        CMP       CS:ALLKEYS,0              ;Allkeys request flag set?
            JE        KB1                       ;If not, jump KB1
            POP       AX                        ;Restore AX
            JMP       DWORD PTR CS:ORIG_INT9    ;Skip popup chain and exit
                                                ;  directly to original.
NEW_INT9    ENDP

;-----------------------------------------------------------------------
; New interrupt 16h handling routine.
;-----------------------------------------------------------------------
NEW_INT16   PROC      NEAR
            ASSUME    CS:CSEG, DS:NOTHING, ES:NOTHING, SS:NOTHING

            STI                                 ;Enable interrupts
            CMP       CS:DISABLE,0              ;Are we disabled?
            JNE       INT16_OUT                 ;Jump out if so.

            CMP       CS:ALLKEYS,0              ;Allkeys' request flag set?
            JE        INT16_OUT                 ;No - Leave through used 16h
            JMP       DWORD PTR CS:ORIG_INT16   ;Yes- Leave through original
INT16_OUT:  JMP       DWORD PTR CS:USED_INT16

NEW_INT16   ENDP

;-----------------------------------------------------------------------
; Routine to beep Allkeys' status through the speaker
; If Allkeys is on, "beep. BEEP"  If Allkeys is off, "BEEP..beep"
;-----------------------------------------------------------------------
BEEP_STATUS PROC      NEAR
            ASSUME    CS:CSEG, DS:NOTHING, ES:NOTHING, SS:NOTHING

            PUSH      CX                        ;Save needed registers
            PUSH      DS

            PUSH      CS                        ;Point DS to our data
            POP       DS
            ASSUME    DS:CSEG

            CMP       ALLKEYS,0                 ;Allkeys off?
            JE        BS2                       ;If so, jump BS2

;Allkeys on - Ascend from a LOW tone to a HIGH tone.

            MOV       CX,TONE_LOW               ;Start at the bottom
BS1:        CALL      SOUND                     ;Make the sound
            ADD       CX,TONE_STEP              ;Add the next step
            CMP       CX,TONE_HIGH              ;Are we over the top?
            JNA       BS1                       ;No - then keep on going
            JMP       BS_OUT                    ;Yes- then jump out

;Allkeys off- Descend from a HIGH tone to a LOW tone.

BS2:        MOV       CX,TONE_HIGH              ;Start at the top
BS3:        CALL      SOUND                     ;Make the sound
            SUB       CX,TONE_STEP              ;Subtract the next step
            CMP       CX,TONE_LOW               ;Are we below the bottom?
            JNB       BS3                       ;No, then keep on going

BS_OUT:     POP       DS                        ;Restore used registers
            POP       CX
            RET

BEEP_STATUS ENDP
```

continues

ALLKEYS.ASM: The assembly language source code for ALLKEYS.COM

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Suppose that each time you boot up, you load a pop-up calendar and a pop-up notepad. Let's assume further that the calendar checks keystrokes using the interrupt 9 method and the notepad checks keystrokes using the interrupt 16h method. Before these two pop-ups were loaded, the path of a keystroke went from keyboard to BIOS to application. Now, however, a keystroke will travel from the keyboard to the calendar to the BIOS to the notepad and then to the application, as illustrated in the 'before' part of the diagram 'How ALLKEYS functions'. If, while on its journey to the application, a keystroke is recognised as its hotkey by either the calendar or the notepad, the keystroke's trip will end prematurely.

Now let's suppose you have loaded ALLKEYS before and after you loaded your calendar and notepad. When ALLKEYS is toggled off, a keystroke will travel from the keyboard to ALLKEYS to the calendar to the BIOS to ALLKEYS to the notepad and finally to the application. When toggled on, however, ALLKEYS builds a bridge over the calendar and notepad, providing even their hotkeys safe passage to the application. Thus, the journey of a keystroke would be from the keyboard to ALLKEYS to the BIOS to ALLKEYS and then to the application, as illustrated in the 'after' part of 'How ALLKEYS functions'.

These are the operational fundamentals; programming for them requires a little more discussion.

Each time ALLKEYS is loaded, it must first determine whether it has been loaded before. It does this by calling the procedure SEC_COPY. This procedure simply searches through memory for the ALLKEYS copyright notice, which is left behind by the first load. If not found — that is, if this is the first load — the current interrupt 9 and 16h vectors are retrieved, using DOS function 35h (Get Interrupt Vector). These original vectors are saved as the addresses to which ALLKEYS will return if it is set to short-circuit the controlled group of TSRs. Having saved these vectors, ALLKEYS terminates, leaving itself resident in memory by using DOS's TSR function.

The pop-ups are then loaded. Each one will save the current vector of either interrupt 9 or 16h and substitute the address of its own routine. When ALLKEYS is loaded the second time, it retrieves and saves the now-modified interrupt 9 and 16h vectors. These modified vectors are used by ALLKEYS to permit normal operation of the controlled TSRs. Once these vectors are pointed at ALLKEYS' replacement handlers, ALLKEYS simply terminates.

Now each time a key is pressed or released, the ALLKEYS interrupt 9 routine is invoked. This routine first inspects the key to see if it's the ALLKEYS hotkey. If not, ALLKEYS checks an internal flag for its on/off status. If the flag is on, ALLKEYS jumps to the original interrupt 9 handler, thus skipping over the pop-ups in between. If it's off, ALLKEYS jumps to the next handler down the line, thus allowing those pop-ups to check for their hotkeys, as normal. If the keystroke were indeed the ALLKEYS hotkey, the

```
;-----------------------------------------------------------------------
; Routine to produce a sound through the speaker.
; CX contains the frequency. Variable TONE_LENGTH contains the length.
;-----------------------------------------------------------------------
SOUND       PROC    NEAR
            ASSUME  CS:CSEG, DS:CSEG, ES:NOTHING, SS:NOTHING

            PUSH    AX                      ;Save needed registers
            PUSH    CX
            PUSH    DX

;Convert the frequency.

            MOV     DX,12h                  ;Upper part
            MOV     AX,34DEh                ;Lower part
            DIV     CX                      ;Divide by frequency
            MOV     CX,AX                   ;to get quotient

;Set the tone.

            MOV     AL,CL                   ;Send low byte
            OUT     42h,AL                  ;out to the timer.
            MOV     AL,CH                   ;Send high byte
            OUT     42h,AL                  ;out to the timer.

;Turn the tone on.

            IN      AL,61h                  ;Get contents of system port B
            OR      AL,3                    ;Turn speaker and timer on
            OUT     61h,AL                  ;Send out new values to port B

;Delay

            MOV     CX,TONE_LENGTH          ;Put delay count in CX
            CALL    DELAY                   ;Delay

;Turn the tone off.

            IN      AL,61h                  ;Get port B again
            AND     AL,0FCh                 ;Turn off timer and speaker
            OUT     61h,AL
            POP     DX                      ;Restore used registers
            POP     CX
            POP     AX
            RET

SOUND       ENDP

;-----------------------------------------------------------------------
; Routine to delay. CX contains the factor.
;-----------------------------------------------------------------------
DELAY       PROC    NEAR

            PUSH    CX                      ;Save outside CX
            MOV     CX,0FFH                 ;Move timing constant in CX
DELAY1:     LOOP    DELAY1                  ;Loop for inside
            POP     CX                      ;Restore outside CX
            LOOP    DELAY                   ;Loop for outside
            RET

DELAY       ENDP

;-----------------------------------------------------------------------
; Routine to reset keyboard and 8259 interrupt controller.
;-----------------------------------------------------------------------
KB_RESET    PROC    NEAR

            IN      AL,61H                  ;Get control port value
            MOV     AH,AL                   ;Save in AH
            OR      AL,80H                  ;Set bit 7
            OUT     61H,AL                  ;Output reset value
            MOV     AL,AH                   ;Send original value...
            JMP     SHORT $+2               ;Take your time
            OUT     61H,AL                  ;...to enable keyboard
            CLI                             ;No interrupts now
            MOV     AL,20H                  ;Send end of interrupt
            OUT     20H,AL                  ;value to 8259.
            STI                             ;Re-enable interrupts
            RET

KB_RESET    ENDP

;-----------------------------------------------------------------------
; Initialization for Allkeys.
;-----------------------------------------------------------------------
INIT        PROC    NEAR
            ASSUME  CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG

;Check if the "/U" parameter was entered on the command line.

            MOV     SI,80h                  ;Point to parm line
            CMP     BYTE PTR [SI],0         ;Any chars entered?
            JNE     INIT1                   ;Yes-jump init1
            JMP     INIT8                   ;No -jump init8

INIT1:      MOV     CL,[SI]                 ;Put parm length in CL
            XOR     CH,CH                   ;Make 16 bit
            INC     SI                      ;Point to next byte
            CLD                             ;Forward

INIT2:      LODSB                           ;Load a byte into AL
            CMP     AL,"/"                  ;Is it our switch?
            JE      INIT3                   ;Jump if so
            LOOP    INIT2                   ;Keep on looking
            JMP     INIT8                   ;No switch found. Jump init8.

INIT3:      AND     BYTE PTR [SI],0DFh      ;Change char to uppercase
            CMP     BYTE PTR [SI],"U"       ;Is it a "U"?
            JE      INIT4                   ;Yes-jump init4
            JMP     INIT8                   ;No -jump init8

;"/U" parameter found. Make sure we're loaded.

INIT4:      CALL    SEC_COPY                ;Check for a second copy.
            JC      INIT5                   ;Jump if found.

            MOV     DX,OFFSET MESG4         ;Print error message
ERR_EXIT:   MOV     AH,9
            INT     21H

            MOV     AX,4C01h                ;Terminate with errorlevel 1
            INT     21H

;Modify resident copy to avoid future searches.

INIT5:      ASSUME  DS:CSEG, ES:NOTHING

            PUSH    ES                      ;Point DS at the resident
            POP     DS                      ;  copy of Allkeys.
            XOR     AX,AX                   ;Point ES at the int vector
            MOV     ES,AX                   ;  table at bottom of memory

            MOV     WORD PTR [FIRST],0FFh   ;This instruction modifies it

;Check if int 9 and 16h vectors point to the resident copy.

            MOV     AX,DS                   ;Put seg of orig copy in AX
            CMP     AX,ES:[ 9*4+2]          ;Compare it to int 9 seg
            JNE     INIT6                   ;Jump if different
            CMP     AX,ES:[16h*4+2]         ;Compare it to int 16h seg
            JNE     INIT6                   ;Jump if different

;Int 9 and 16h vectors point to resident copy.
;Restore int 9 and 16h vectors and release resident copy from memory.
;Then terminate.
```

continues

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status flag is toggled to reflect the new status and the BEEP_STATUS routine is called to confirm it.

The ALLKEYS interrupt 16h handler is given to accommodate pop-ups that check for their hotkey using this interrupt. This routine checks ALLKEYS' status and transfers control. When on, ALLKEYS will jump to the original interrupt 16h. When ALLKEYS is off, control is passed, as it would normally be, to the next pop-up down the line.

The BIOS provides a means of beeping the speaker by printing a character 7 (BELL), using interrupt 10h function OEh. Unfortunately, however, using this technique there is no way to produce a specific frequency for a specific time period. Therefore, as shown in the .ASM listing, ALLKEYS incorporates its own routines to produce the on/off status tones.

To accommodate uninstallation, ALLKEYS checks for the /U parameter during initialisation. If /U is found, ALLKEYS checks to see if it is loaded by calling procedure SEC_COPY. If it is, it checks to determine if a second copy is also installed. If it isn't, ALLKEYS releases the first copy from memory. If it is installed, ALLKEYS checks to make sure the interrupt vectors 9 and 16h still point to ALLKEYS' own keyboard handlers. If they don't, ALLKEYS sets an internal flag to disable itself. (Notice variable DISABLE at the beginning of the assembly language listing.) If the vectors do point to ALLKEYS' handlers, they are pointed back to the TSR-modified interrupt 9 and 16h vectors, thus removing ALLKEYS from the pop-up chain. ALLKEYS then releases itself from memory to complete the process.

If you followed the logic in that explanation, you'll know why ALLKEYS cannot point the interrupt 9 and 16h vectors to the modified ones if any other pop-ups have been loaded after it. The reason is that to do so would mean removing those pop-ups, in addition to ALLKEYS, from the pop-up chain. To avoid doing this, ALLKEYS has built-into it a disable mechanism. Whenever an interrupt 9 or 16h is being processed, ALLKEYS will first check variable DISABLE. When set to one, ALLKEYS will not respond to the Ctrl-Alt-Z combination and will allow all keystrokes to be processed normally.

Modifying ALLKEYS

If you find ALLKEYS' hotkey combination, Ctrl-Alt-Z, hard to remember or are un-

```
            ASSUME    DS:NOTHING, ES:CSEG

            PUSH      DS                          ;Point ES at the resident
            POP       ES                          ;  copy of Allkeys.

            MOV       AX,2509H                    ;Restore interrupt 9
            MOV       DX,ES:[USED_INT9  ]
            MOV       DS,ES:[USED_INT9+2]
            INT       21H

            MOV       AX,2516H                    ;Restore interrupt 16h
            MOV       DX,ES:[USED_INT16  ]
            MOV       DS,ES:[USED_INT16+2]
            INT       21H

            MOV       AH,49H                      ;Have DOS release it from
            INT       21H                         ;  memory.

            ASSUME    DS:CSEG, ES:CSEG
            PUSH      CS                          ;Point DS back at our data
            POP       DS

            MOV       DX,OFFSET MESG5             ;Display status message.
OK_EXIT:    MOV       AH,9
            INT       21H

            MOV       AX,4C00h                    ;Terminate with no errorlevel
            INT       21H

;Int 9 and 16h vectors do not point to resident copy.
;Check if resident copy was only installed LOW.

INIT6:      CMP       USED_INT9,0                 ;Only installed LOW?
            JNE       INIT7                       ;Jump if not

;Allkeys only installed LOW.
;Just simply release it from memory and terminate.

            ASSUME    DS:CSEG, ES:CSEG

            PUSH      DS                          ;Point ES at the resident
            POP       ES                          ;  copy of Allkeys.
            PUSH      CS                          ;Point DS back to our data.
            POP       DS

            MOV       AH,49H                      ;Have DOS release it from
            INT       21H                         ;  memory.

            MOV       DX,OFFSET MESG5             ;Display OK message
            JMP       OK_EXIT                     ;  and terminate.

;Allkeys installed HIGH and LOW.
;Set DISABLE flag to disable Allkeys  Then terminate.

INIT7:      MOV       DISABLE,1                   ;Disable Allkeys

            MOV       DX,OFFSET MESG3             ;Print error message
            JMP       ERR_EXIT                    ;  and terminate.


;"/U" parameter wasn't entered. Check to see if Allkeys already loaded.

INIT8:      ASSUME    DS:CSEG, ES:CSEG

            CALL      SEC_COPY                    ;Check for a second copy
            JC        INIT9                       ;Jump if found

;Second copy not found.
;Release the environment to conserve memory.
;Save the current interrupts 9 and 16h. Then TSR.

            ASSUME    DS:CSEG, ES:NOTHING

            MOV       AX,WORD PTR DS:[2CH]        ;Release the environment.
            MOV       ES,AX
            MOV       AH,49H
            INT       21H

            MOV       AX,3509H                    ;Get interrupt 9
            INT       21H
            MOV       [ORIG_INT9  ],BX            ;Save the offset
            MOV       [ORIG_INT9+2],ES            ;Save the segment

            MOV       AX,3516H                    ;Get interrupt 16h
            INT       21H
            MOV       [ORIG_INT16  ],BX           ;Save the offset
            MOV       [ORIG_INT16+2],ES           ;Save the segment

            MOV       DX,OFFSET COPYRIGHT         ;Display copyright
            MOV       AH,9
            INT       21H

            MOV       AX,3100h                    ;Terminate and leave all
            MOV       DX,(OFFSET INIT - OFFSET CSEG + 15) SHR 4
            INT       21H                         ;  code but the init portion
                                                  ;  resident in memory. (TSR)

;Second copy was found.
;Make sure Allkeys not already installed high and low.

INIT9:      ASSUME    DS:CSEG, ES:CSEG

            PUSH      ES                          ;Point DS at the original
            POP       DS                          ;  copy of Allkeys.

            CMP       USED_INT9,0                 ;Already installed high & low?
            JE        INIT10                      ;Jump if not.

            MOV       DX,OFFSET MESG2             ;Display error message
            JMP       ERR_EXIT                    ;  and terminate.

;Obtain and save the used interrupts 9 and 16h to the original copy.

INIT10:     ASSUME    DS:CSEG, ES:NOTHING

            MOV       AX,3509H                    ;Get used interrupt 9
            INT       21H
            MOV       [USED_INT9  ],BX            ;Save the offset
            MOV       [USED_INT9+2],ES            ;Save the segment

            MOV       AX,3516H                    ;Get used interrupt 16h
            INT       21H
            MOV       [USED_INT16  ],BX           ;Save the offset
            MOV       [USED_INT16+2],ES           ;Save the segment

;Activate Allkeys by pointing interrupt vectors 9 and 16h
;to the resident copy's new interrupt 9 and 16h handlers.

            MOV       AX,2509H                    ;Set interrupt 9
            MOV       DX,OFFSET NEW_INT9
            INT       21H
            MOV       AX,2516H                    ;Set interrupt 16h
            MOV       DX,OFFSET NEW_INT16
            INT       21H

            MOV       DX,OFFSET MESG1             ;Display ready message
            JMP       OK_EXIT                     ;  and terminate.

INIT        ENDP

;---------------------------------------------------------------------------
; Routine to search through memory for a previous loaded copy of Allkeys.
; If found, on return, CF will be set and ES will point to previous copy.
;---------------------------------------------------------------------------
SEC_COPY    PROC      NEAR
            ASSUME    CS:CSEG, DS:CSEG, ES:NOTHING, SS:CSEG

            MOV       WORD PTR [FIRST],0          ;Modify to avoid false alarm
            MOV       BX,600h                     ;BX= start of our search
            MOV       AX,CS                       ;AX= end of our search
            CLD                                   ;Forward
NEXT_PARA:
            INC       BX                          ;Next paragraph
            CMP       AX,BX                       ;If current paragraph...
            MOV       ES,BX                       ;Set search segment
            JE        END_SEARCH                  ;.. .stop

            MOV       SI,OFFSET FIRST             ;Compare FIRST label
            MOV       DI,SI                       ;Offset is same
            MOV       CX,16                       ;Only FIRST 16 bytes
            REP       CMPSB                       ;Compare DS:SI TO ES:DI
            OR        CX,CX                       ;All matched?
            JNZ       NEXT_PARA                   ;No, keep on looking.

            STC                                   ;Found a copy in memory.
            RET                                   ;  Set CF and RETurn.

END_SEARCH: CLC                                   ;Didn't find a copy.
            RET                                   ;  Clear CF and RETurn.

SEC_COPY    ENDP

CSEG        ENDS
            END       FIRST
```

ends

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```
100 REM - BASIC PROGRAM TO CREATE ALLKEYS.COM (PC Magazine June 28,1988)
110 CLS:PRINT "Creating ALLKEYS.COM": OPEN "ALLKEYS.COM" AS #1 LEN = 1
120 FIELD #1, 1 AS A$: CHECKSUM#=0
130 FOR I = 1 TO 55: LINESUM#=0: LOCATE 2,3: PRINT "Countdown: " 55 - I;
140  FOR J = 1 TO 16 : READ BYTE$: CHECKSUM#=CHECKSUM#+VAL("&H"+BYTE$)
150   LINESUM#=LINESUM#+VAL("&H"+BYTE$)
160   IF (BYTE < 256) THEN LSET A$=CHR$(VAL("&H"+BYTE$)): PUT #1
170   NEXT J
180  READ LINETOT$: LINECHECK# = VAL("&H" + LINETOT$)
190  IF LINECHECK# = LINESUM# THEN GOTO 210
200  LOCATE 4,2: PRINT "Error in line #";240 + 10 * I
210 NEXT I
220 CLOSE: LOCATE 6,2: IF CHECKSUM# <> 76568 THEN GOTO 240
230 PRINT "ALLKEYS.COM  created successfully": SYSTEM
240 PRINT "ALLKEYS.COM  is not valid!": SYSTEM
250   DATA E9, 25,  2, 41, 4C, 4C, 4B, 45, 59, 53, 20, 31, 2E, 30, 20, 28, 41C
260   DATA 63, 29, 20, 31, 39, 38, 38, 20, 5A, 69, 66, 66, 20, 43, 6F, 6D, 474
270   DATA 6D, 75, 6E, 69, 63, 61, 74, 69, 6F, 6E, 73, 20, 43, 6F, 2E,  D, 5B7
280   DATA  A, 50, 43, 20, 4D, 61, 67, 61, 7A, 69, 6E, 65, 20, FE, 20, 52, 579
290   DATA 6F, 62, 65, 72, 74, 20, 4C, 2E, 20, 4D, 6F, 72, 74, 6F, 6E,  D, 562
300   DATA  A, 4C, 6F, 77, 20, 63, 6F, 70, 79, 20, 69, 6E, 73, 74, 61, 6C, 5C2
310   DATA 6C, 65, 64,  D,  A, 24, 41, 4C, 4C, 4B, 45, 59, 53, 20, 68, 69, 476
320   DATA 67, 68, 20, 63, 6F, 70, 79, 20, 69, 6E, 73, 74, 61, 6C, 6C, 65, 626
330   DATA 64,  D,  A, 43, 74, 72, 6C, 2D, 41, 6C, 74, 2D, 5A, 20, 74, 6F, 4E8
340   DATA 20, 74, 6F, 67, 67, 6C, 65, 20, 74, 73, 72, 27, 73, 20, 6F, 6E, 5B2
350   DATA 2F, 6F, 66, 66,  D,  A, 24, 41, 4C, 4C, 4B, 45, 59, 53, 20, 61, 43B
360   DATA 6C, 72, 65, 61, 64, 79, 20, 69, 6E, 73, 74, 61, 6C, 6C, 65, 64, 661
370   DATA 20, 68, 69, 67, 68, 20, 61, 6E, 64, 20, 6C, 6F, 77,  D,  A, 24, 4C0
380   DATA 56, 65, 63, 74, 6F, 72, 73, 20, 63, 6F, 75, 6C, 64, 20, 6E, 6F, 61A
390   DATA 74, 20, 62, 65, 20, 72, 65, 73, 74, 6F, 72, 65, 64, 20, 2D, 20, 550
400   DATA 41, 4C, 4C, 4B, 45, 59, 53, 20, 64, 69, 73, 61, 62, 6C, 65, 64, 56D
410   DATA  D,  A, 24, 41, 4C, 4C, 4B, 45, 59, 53, 20, 6E, 6F, 74, 20, 6C, 44D
420   DATA 6F, 61, 64, 65, 64, 20, 79, 65, 74,  D,  A, 24, 41, 4C, 4C, 4B, 4CE
430   DATA 45, 59, 53, 20, 75, 6E, 2D, 69, 6E, 73, 74, 61, 6C, 6C, 65, 64, 5E1
```

continues

ALLKEYS.BAS: A Basic program that will automatically create ALLKEYS.COM

comfortable with the on/off status tones, you can personalise ALLKEYS to suit your needs. By changing the values of particular variables in the assembler listing, you can produce a customised version of ALLKEYS efficiently, and even if you don't have an assembler, you can still patch ALLKEYS with DEBUG.

Two variables at the beginning of the assembly language listing, HOTKEY and SHIFT_MASK, determine the exact ALLKEYS hotkey. The variable HOTKEY sets the 'make-scan code' of the key. This is the number the keyboard sends to the BIOS keyboard handler when a key is pressed.

The table 'Keyboard scan codes for alternative hotkeys' contains all of the 'make' scan code values and their corresponding keys.

Variable SHIFT_MASK corresponds to the shift keys: Alt, Ctrl, Left Shift, and Right Shift. The value for this variable is determined by which shift keys must be pressed simultaneously with the hotkey, to toggle ALLKEYS on and off. The 'SHIFT_MASK value table' contains all possible shift-key combinations and their corresponding values.

To change the ALLKEYS hotkey by reassembling with either the IBM or Microsoft macro assembler, simply substitute the new values for HOTKEY and SHIFT_MASK in the assembly program. Then from the DOS prompt, enter

```
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LINK ALLKEYS;
EXE2BIN ALLKEYS ALLKEYS.COM
```


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```
440   DATA  D,  A, 24,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 3B
450   DATA  0,  0,  0, 2C,  C,  0,  0, F4,  1, DC,  5, F4,  1, 32,  0, FB, 430
460   DATA 50, 2E, 80, 3E, 46,  2,  0, 75, 22, E4, 60, 2E, 3A,  6, 43,  2, 412
470   DATA 75, 1F, B4,  2, CD, 16, 24,  F, 2E, 3A,  6, 44,  2, 75, 12, E8, 483
480   DATA A1,  0, 2E, 80, 36, 45,  2, FF, E8, 2F,  0, 58, 2E, FF, 2E, 3B, 5D0
490   DATA  2, 2E, 80, 3E, 45,  2,  0, 74, F2, 58, 2E, FF, 2E, 33,  2, FB, 57E
500   DATA 2E, 80, 3E, 46,  2,  0, 75,  D, 2E, 80, 3E, 45,  2,  0, 74,  5, 362
510   DATA 2E, FF, 2E, 37,  2, 2E, FF, 2E, 3F,  2, 51, 1E,  E, 1F, 80, 3E, 48A
520   DATA 45,  2,  0, 74, 14, 8B,  E, 47,  2, E8, 21,  0,  3,  E, 4B,  2, 318
530   DATA 3B,  E, 49,  2, 76, F3, EB, 12, 90, 8B,  E, 49,  2, E8,  D,  0, 563
540   DATA 2B,  E, 4B,  2, 3B,  E, 47,  2, 73, F3, 1F, 59, C3, 50, 51, 52, 4AC
550   DATA BA, 12,  0, B8, DE, 34, F7, F1, 8B, C8, 8A, C1, E6, 42, 8A, C5, 993
560   DATA E6, 42, E4, 61,  C,  3, E6, 61, 8B,  E, 4D,  2, E8,  A,  0, E4, 681
570   DATA 61, 24, FC, E6, 61, 5A, 59, 58, C3, 51, B9, FF,  0, E2, FE, 59, 8D8
580   DATA E2, F7, C3, E4, 61, 8A, E0,  C, 80, E6, 61, 8A, C4, EB,  0, E6, A3D
590   DATA 61, FA, B0, 20, E6, 20, FB, C3, BE, 80,  0, 80, 3C,  0, 75,  3, 761
600   DATA E9, 98,  0, 8A,  C, 32, ED, 46, FC, AC, 3C, 2F, 74,  5, E2, F9, 7E3
610   DATA E9, 88,  0, 80, 24, DF, 80, 3C, 55, 74,  3, EB, 7E, 90, E8, F0, 84D
620   DATA  0, 72,  C, BA,  3,  2, B4,  9, CD, 21, B8,  1, 4C, CD, 21,  6, 4E1
630   DATA 1F, 33, C0, 8E, C0, C7,  6,  0,  1, FF,  0, 8C, D8, 26, 3B,  6, 5F8
640   DATA 26,  0, 75, 39, 26, 3B,  6, 5A,  0, 75, 32, 1E,  7, B8,  9, 25, 347
650   DATA 26, 8B, 16, 3B,  2, 26, 8E, 1E, 3D,  2, CD, 21, B8, 16, 25, 26, 41C
660   DATA 8B, 16, 3F,  2, 26, 8E, 1E, 41,  2, CD, 21, B4, 49, CD, 21,  E, 4DE
670   DATA 1F, BA, 1C,  2, B4,  9, CD, 21, B8,  0, 4C, CD, 21, 83, 3E, 3B, 590
680   DATA  2,  0, 75,  D, 1E,  7,  E, 1F, B4, 49, CD, 21, BA, 1C,  2, EB, 484
690   DATA E3, C6,  6, 46,  2,  1, BA, D0,  1, EB, 8B, E8, 73,  0, 72, 32, 6F8
700   DATA A1, 2C,  0, 8E, C0, B4, 49, CD, 21, B8,  9, 35, CD, 21, 89, 1E, 691
710   DATA 33,  2, 8C,  6, 35,  2, B8, 16, 35, CD, 21, 89, 1E, 37,  2, 8C, 45B
720   DATA  6, 39,  2, BA,  3,  1, B4,  9, CD, 21, B8,  0, 31, BA, 33,  0, 480
730   DATA CD, 21,  6, 1F, 83, 3E, 3B,  2,  0, 74,  6, BA, A7,  1, E9, 45, 51B
740   DATA FF, B8,  9, 35, CD, 21, 89, 1E, 3B,  2, 8C,  6, 3D,  2, B8, 16, 566
750   DATA 35, CD, 21, 89, 1E, 3F,  2, 8C,  6, 41,  2, B8,  9, 25, BA, 4F, 4CF
760   DATA  2, CD, 21, B8, 16, 25, BA, 8F,  2, CD, 21, BA, 66,  1, E9, 63, 689
770   DATA FF, C7,  6,  0,  1,  0,  0, BB,  0,  6, 8C, C8, FC, 43, 3B, C3, 61F
780   DATA 8E, C3, 74, 10, BE,  0,  1, 8B, FE, B9, 10,  0, F3, A6,  B, C9, 753
790   DATA 75, EB, F9, C3, F8, C3,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 4D7
```

ends

To change the ALLKEYS hotkey using DEBUG, you'll need to substitute the new HOTKEY code where you see SS and the new SHIFT_MASK value where you see MM in the following script. One convenient feature of this process is that it's not necessary to type in anything to the right of the semicolons.

```
DEBUG ALLKEYS.COM
E 243 SS                ;Scan code
E 244 MM                ;Shift mask
W
Q
```

The ALLKEYS on off status tones are determined by the variables TONE_LOW TONE_HIGH. TONE_STEP and TONE_LENGTH. These variables are also located at the beginning of the assembly language listing. When ALLKEYS is toggled on the variable TONE_LOW sets the starting frequency of the ascending tone sequence and the variable TONE_HIGH marks its end. When ALLKEYS is toggled off. TONE_HIGH marks the starting frequency of the descending tone sequence and TONE_LOW marks the ending. To move the two boundaries, substitute a value between 37 and 32767 for TONE_LOW and TONE_HIGH. TONE_HIGH should be at least equal to TONE_LOW plus 1.

The variable TONE_STEP determines the size of the steps ALLKEYS takes between tones when ascending or descending between boundaries set by TONE_LOW and TONE_HIGH. To change the step, substitute a value between 1 and 65535 for TONE_STEP.

Finally, the variable TONE_LENGTH sets the length of the individual tones. To change the length of each tone, sub-

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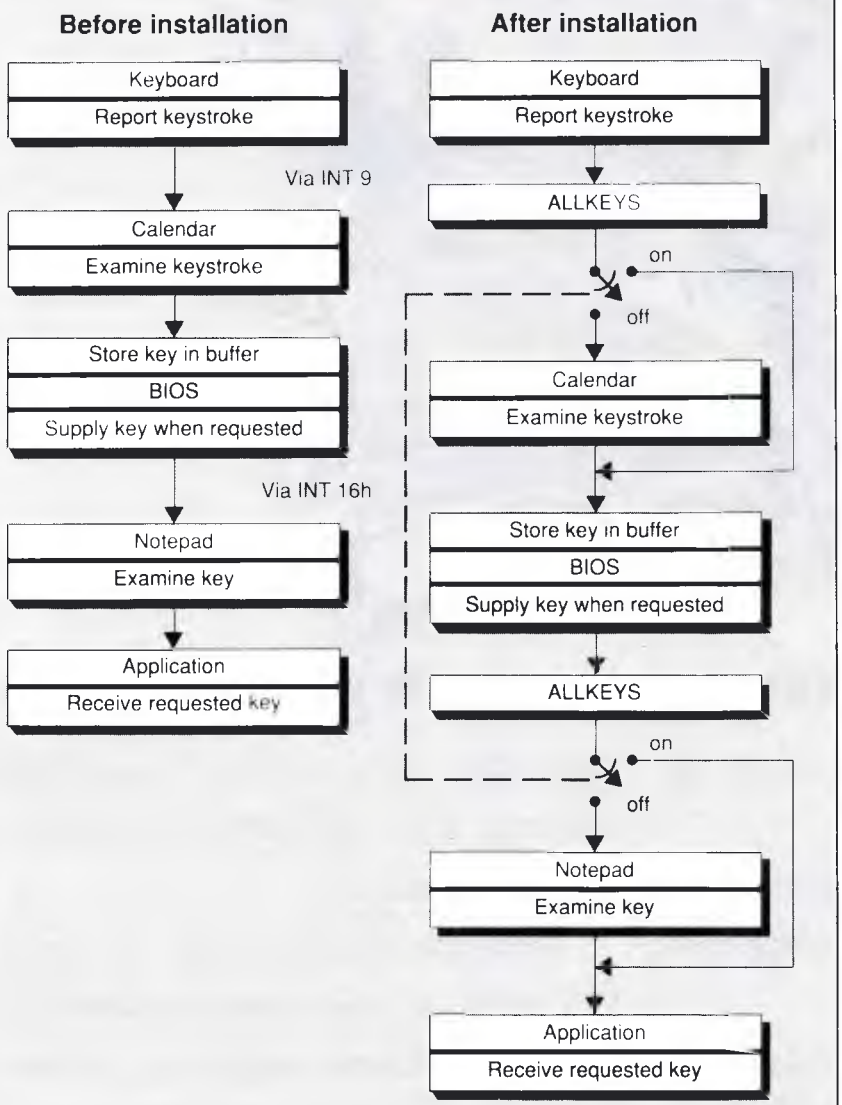
How ALLKEYS functions



Without ALLKEYS installed, all keystrokes are examined by any TSRs that have been loaded. A key combination that is appropriated by a TSR is never passed through to an underlying application. With ALLKEYS installed, however, the path followed by keystrokes can be switched to bypass the TSRs as if they were never loaded

Keyboard scan codes for alternative hotkeys

Key	Scan code in hex	Key	Scan code in hex
Esc	01	Z	2C
!1	02	X	2D
@2	03	C	2E
#3	04	V	2F
$4	05	B	30
%5	06	N	31
^6	07	M	32
&7	08	<,	33
*8	09	>.	34
(9	0A	?/	35
)0	0B	Right Shift	36
_-	0C	PrtSc*	37
+=	0D	Alt	38
Backspace	0E	Spacebar	39
Tab	0F	CapsLock	3A
Q	10	F1	3B
W	11	F2	3C
E	12	F3	3D
R	13	F4	3E
T	14	F5	3F
Y	15	F6	40
U	16	F7	41
I	17	F8	42
O	18	F9	43
P	19	F10	44
{[	1A	NumLock	45
}]	1B	ScrollLock	46
Enter	1C	7 Home	47
Ctrl	1D	8 Up Arrow	48
A	1E	9 PgUp	49
S	1F	-	4A
D	20	4 Left Arrow	4B
F	21	5	4C
G	22	6 Right Arrow	4D
H	23	+	4E
J	24	1 End	4F
K	25	2 Down Arrow	50
L	26	3 PgDn	51
:;	27	0 Ins	52
"'	28	. Del	53
~`	29	SysReq	54
Left Shift	2A	F11	57
|	2B	F12	58

If the key combination that activates the program is not to your liking, it can be changed. Choose a hotkey from the table above and substitute its scan code in the program

stitute a value between 1 and 65535 for TONE_LENGTH.

For users patching with DEBUG, in the following script, LL corresponds to the low boundary, HH to the high boundary, SS to the step, and NN to the length of each tone.

However, you'll need a decimal conversion table or a scientific calculator to convert these values to hexadecimal before substituting. SideKick users will find their pop-up calculators handy for this.

```
DEBUG ALLKEYS.COM
E 247 LL        ;Tone Low
E 249 HH        ;Tone High
E 24B SS        ;Tone Step
E 24D NN        ;Tone Length
W
Q
```

(Note: Because a word is stored backwards in memory, least significant byte first, you must enter the bytes backwards. For example, to change TONE_STEP (SS) to 500, you would first convert it to its hexadecimal equivalent, 01F4. Then, you would enter 'F4 01' for SS. DEBUG also requires that you enter the space between bytes.)

Here are a few examples you can try:

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SHIFT_MASK value table

SHIFT_MASK value	Shift key (● = Pressed) Alt	Ctrl	Left Shift	Right Shift
0				
1				●
2			●	
3			●	●
4		●		
5		●		●
6		●	●	
7		●	●	●
8	●			
9	●			●
A	●		●	
B	●		●	●
C	●	●		
D	●	●		●
E	●	●	●	
F	●	●	●	●

The combination of shift keys needed to pop the program up corresponds to a unique SHIFT_MASK value. Use this value when altering the program's default activation keys as explained in the article

```
LL = F4 01
HH = DC 05
SS = 32 00
NN = 05 00
```

creates a synthesised effect:

```
LL = 30 75
HH = 31 75
SS = 01 00
NN = 01 00
```

turns off the status tones:

```
LL = 64 00
HH = BC 02
SS = 59 02
NN = 64 00
```

creates a one-tone status.

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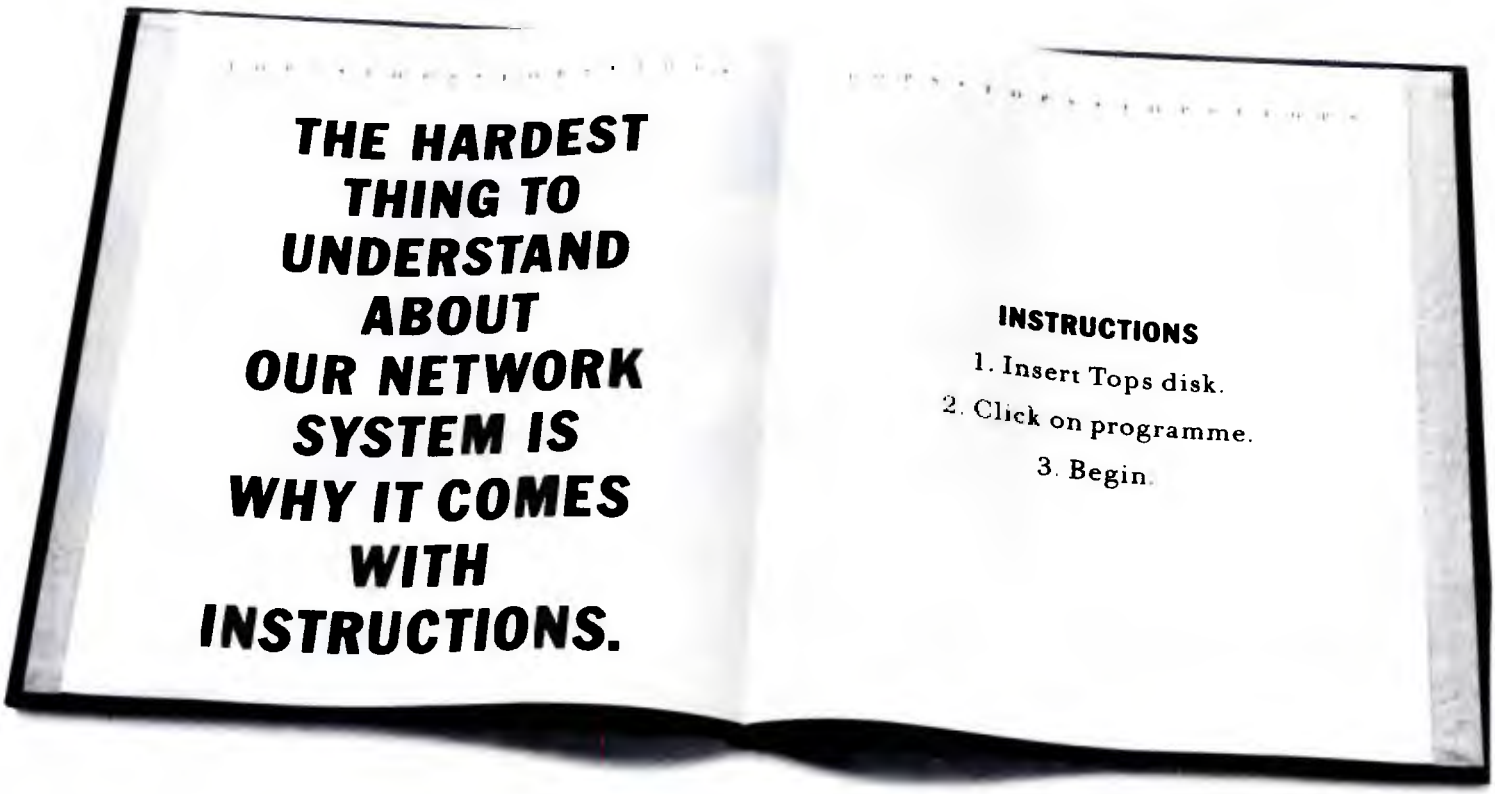
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Steve Withers and Peter Tootill dial into the Callbox telephone organiser system, and present a full guide to the nation's bulletin boards.

Have you ever had a telephone bill which you thought was rather excessive? You may have used SideKick to maintain a list of telephone numbers and to dial them, but wondered why your computer couldn't keep an account of the cost of the calls as well. Well, with the aid of a new British product, it can. Normally, I don't bother to report on products that aren't available in Australia, but this one seemed such a good idea that I took the opportunity to take a close look.

Callbox is a comprehensive telephone dialler, call-logger, address book and note book. The manufacturer, Callbox Ltd, claims it creates an electronic bond between your PC and the telephone.

The first thing that struck me about Callbox is the care that has gone into the packaging and presentation of the device. Everything from the adhesive tape around the box in which it arrived to the floppy disk with the software on it, carries the Callbox name and logo. This may seem irrelevant but it made me think that, if the company cares enough about the presentation to get it right, it probably cares enough about the execution to do the same. Whether I was right, we'll see in due course.

The Callbox system consists of a standard IBM PC plug-in card (called the 'integrator') and a small, stylish speaker unit. The software comes on one floppy disk and is not copy-protected. The integrator has a lead with a telephone connector and two sockets — a standard telephone type for your telephone handset and a miniature jack socket for the Callbox speaker.

Setting up

Installation is well-explained in the manual. With the hardware it is simply a matter of plugging first the integrator into a spare slot in your PC; second, its telephone lead into a nearby telephone point; and third, the telephone and speaker into the back of the Callbox integrator.

Installing the software is straightforward. A batch file supplied on the disk sets up a Callbox sub-directory and copies the system files into it. It also adds the Callbox device driver to your CONFIG.SYS file. The instructions warn you that this will happen, and if you don't trust this type of installation system (and I know that many don't), you can copy it to a back-up file before installation. Callbox can run from a floppy disk, but a hard disk is preferable as the program needs constant access to its phonebook and accounts files.

Callbox is a memory-resident program and the instructions recommend that you add it to your AUTOEXEC.BAT file so that it is always ready for use. I'm not a great user of memory-resident software. However I ran Callbox with SideKick, and Dos Edit loaded and had no problems switching between the programs.

At the time of writing, Callbox Ltd told me that Callbox would not run under DesQview. It certainly didn't co-reside very happily with my BBS software, but that wasn't surprising as this is not very well-behaved and reacts badly to the presence of any other software. My recommendation with any resident software is that you save your work frequently. That way you are not likely to lose a lot if something does go wrong.

When Callbox has been installed, you are faced with the marathon task of adding names and phone numbers to the phonebook. This can hold up to 1000 items and, if that isn't enough, you can have subsidiary phonebooks as well. In fact, the phonebook is quite a comprehensive address book with room for contact names and notes as well as phone numbers.

If you don't already have a database which contains this information, then it's just a matter of adding it bit by bit. However, a utility to import data from another database would have been a useful addition to the system.

In use

Dialling a number using Callbox (it supports tone and pulse dialling, or a mixture of the two) is simply a matter of pressing Shift-Alt to bring up the Callbox menu and selecting the name of the person you want to call from the phonebook. Selection is easy; each person is assigned a six-character code when the entry is set up and the phonebook screen opens at the first page with a small box at the top labelled 'Search For'. You type in the code you have assigned to the person and Callbox finds it for you.

The program uses a progressive search, so as you type in the characters for 'SMITH5', for example, it automatically moves to the next matching entry as each character is added. Thus, names are found very quickly.

Dialling is just a matter of pressing Return when the correct entry is highlighted. Each number dialled is added to the re-dial list (with a flag to indicate whether the call was successful or not) so that it can be easily re-dialled. A queue of numbers also can be set up, each with an associated time if desired; and Callbox will prompt you at the appropriate moment, even if it's in the background at the time.

The speaker monitors progress during dialling and the volume can be adjusted — off, low, medium and high. High should be loud enough for even a noisy office environment. If the number is engaged, Callbox will re-dial up to the four times permitted by the regulations in the UK. When the call is answered, you

Callbox offers a telephone dialler and call-logger service

pick up the handset and the speaker turns itself off.

During the course of a call, Callbox displays a box onscreen telling you whom you are calling and, more importantly, how long you've been on and how much it has cost so far — this can be a sobering experience! If it gets too much for you, you can press Shift-Alt again and put Callbox back in the background where it will continue to monitor the call.

When the call is finished, the cost is added to the total phone bill and also to any relevant sub-accounts (you can define up to ten of these, each containing up to nine names). This enables the cost to be recharged later to a client.

It is possible to call up a small notepad, allowing six lines of 49 characters. Notes can be general or associated with individual people or calls. The notepad is a little rudimentary and would benefit from a few text-editor type commands. The only way to move about the pad is one character at a time with the cursor keys — no word-processor style jumps — and, when the note has been saved, it cannot be edited. Nor is there any way to search for a note containing a particular phrase or name, unlike the phonebook which does have a comprehensive search feature.

Moving around the various Callbox menus is very simple. Cursor keys, the Tab key or the first letter of the relevant entry all can be used. I found that, in general, everything worked just as I expected it to: there were none of the annoying little inconsistencies that sometimes creep in. Context sensitive help is usually available via the F1 key. However, it doesn't work when filling in a phonebook entry (say, if you were to forget what one of the boxes was for).

Another quibble is that it's quite an effort to access the function key map. I would have liked this instantly available as Callbox makes use of all the function keys for sub-menus, notes, and so on.

If you want to dial a number that is not in the phonebook, then you can just type it in. Callbox expects any number entered while it is waiting to make a call to be a phone number. It can also pick telephone numbers off the screen in the same way that SideKick does, so you can dial numbers that are included in another database by displaying the relevant entry on the screen, bringing up Callbox and pressing the space bar. This type of call is monitored and added to the phone bill, but not to cost centres.

Using Callbox with modems

Callbox can be used in conjunction with a terminal program and a modem to dial and monitor the cost of data calls. (This facility is a little cumbersome and is only superficially covered in the manual.) You load your terminal program, get ready to go online (type 'To' if it's a Hayes-type model but don't press Return just yet), bring up Callbox and dial the number. You immediately put Callbox in the background and, as soon as the other modem answers, put yours online — either manually or by pressing Return (after the 'ATD'). Callbox will monitor the call time and cost in the usual way, and you can check on these at any time by pressing Shift-Alt to bring back the status box. If you have a manual-dial modem, then this gives you the advantages of an auto-dial one without the cost of upgrading.

If you use auto-logon sequences, then you will have to change them to suit the new method of operation.

Utilities

Callbox comes with a utility program that is used to maintain the call charge bands (you can have up to 26), set up the printer (page width, length, setup string, and so on), and print the phonebook, notes and logs or accounts. Printouts can be directed to a disk file and to the printer.

Documentation

The manual is generally good but lacks an index (one of my pet hates about *any* manual) and some screenshots would have helped to make certain areas clearer. It contains a short but useful tutorial section which is used in conjunction with a tutorial phonebook on disk.

Conclusion

Callbox has been well planned and implemented. It worked reliably, although it occasionally mis-dialled, generating a 'number unobtainable' tone from the speaker. However, it was simple enough to re-dial. Also, the Callbox can't be unloaded after use, except by rebooting. These, and a number of other minor problems, are due to be fixed in the next release.

Callbox costs around $355 and represents very good value for money.

END

Systems

Entries are presented in the following format: system name, phone number, access rights ('P' for public, and 'M' for members — the latter may have a 'V' showing that visitors have some limited access), operator's name, modem standards (V21 = 300 baud, V22 = 1200, V22bis = 2400, V23 = 1200/75; if no standard is shown, assume V21), and then any other information.

NSW

2000 And Beyond (02) 522 6514. MV. Greg Kuhnert. V21, V22, V23, Bell 103, 212.

Airlock Hermitage (02) 600 1384. MV. Greg Glynn. 5.30pm-8am weekdays, 24 hours weekends. V21, V22, V22bis, V23. FidoNet 713/609.

Alpha Juno (02) 774 1543. MV. Kevin Withnall. 6pm-6am. V22, V22bis only. FidoNet 620/701.

Amiga Zone (02) 771 6351. MV. Richard Duffy. 9pm-7am daily. V21, V22, V23, Bell 103, 212.

Amstrad (02) 981 2966. MV. Riccay Schmahl. V21, V22, V22bis, V23. FidoNet 711/903.

Apollowline (02) 869 8349. MV. Richard Heppell. V21, V22, V23.

Apple Users Group-Apple II (02) 498 7084. MV. Cameron Brawn. 24 hours daily. V21, V22, V22bis, V23.

Aquarius (02) 686 2798. MV. Glen Harvy. V21, V22, V22bis, V23, Bell 103, 212. FidoNet node 713/608.

Arco-Tel (02) 683 3956. MV. Alex Sardo. 24 hours daily. V21, V22, V22bis, V23. FidoNet 713/601

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Arknet (02) 868 4836. M. Andrew Khoo. V22, V22bis. Bell 103. Log on as guest, and mail user admin for access.

Augur (02) 311 3052. MV. Mark James. V21, V22, V22bis, V23. FidoNet 712/302.

Australian Pick Users (02) 631 8603. MV. Kurt Johannesen. 24 hours daily. V21, V22, V22bis, V23.

Bad News Travels Fast (02) 540 1879. MV. James Stevenson. V21. V22. V23.

Bee-Hive (02) 520 5181. P. Paul Pinches. 9am-6pm Friday-Monday.

Black Hole (02) 81 4253. MV. Ken Thompson. V21, V22, V23, Bell 103, 212.

Books (02) 281 4791. Jon and Chris Ruwolt. V21, V22, V22bis, V23.

Bramblebush (02) 829 1809. MV. Ken Allan. V21, V22. 24 hours Mon-Sat.

Cesspit (02) 543 7204. Andrew Winter. V22, Bell 103, 212.

Club Amiga (02) 521 6338. MV Ross Kellaway. 24 hours daily. V21, V22. Amiga and C64.

Club Mac (02) 73 1992 MV. Jason Haines. 24 hours daily. V21. V22. V22bis, V23.

Club 80 (02) 332 2494. MV. Michael Cooper. 24 hours daily. V21. V23.

CoCo Arena (02) 646 5573. John Kelly. V21, V22.

CoCo Connection (02) 618 3591. MV. Barry Dornton. 24 hours daily. V21, V22, V22bis.

Comet (02) 599 7342. MV. Eric Davis. 24 hours daily.

Commodore 64 (02) 664 2334. MV. Graham Lee. 24 hours daily.

Commodore Pursuit (02) 522 9507. MV. Warren Hillsdon. 24 hours daily. V21, V22, V23 (NetComm 123A).

Contact (02) 798 6368. MV. Peter Hall. V21, V22, V23. Bell 103,212.

Csace (02) 529 8249. MV. Larry O'Keefe. 24 hours daily.

Cursor Contact (02) 637 8131. MV. 'Infiltrator'.

Cybersoft (02) 212 2261 MV. Mark Fawcett. V22, V22bis, V23.

Dharruk (02) 625 3246. Punternet node 10.

Dick Smith Electronics (02) 887 2276. P. Paul Beaver. 24 hours daily. V21, V22.

Dingo's Den (02) 888 2203. MV. David Harvey. V21, V22, V22bis. V23. FidoNet 711/802.

Down Under (02) 674 6647. MV. Glen Myles.

Dream Time (02) 93 5225. MV. Chris Geddes. 9pm-7am daily.

Eagle One (02) 745 3190. MV. Terry Harvey. V21, V22, V23.

Eagle's Nest (02) 451 0535. MV. Philip Dean. 24 hours daily.

EasyComm (02) 558 9620. MV. Michael Aldiholic. 9pm-7am weekdays, 24 hours weekends. V21, V22, V22bis. FidoNet 712/505.

Exchange FRP (02) 644 9211 Cameron Martin and Scott Caundle. 7pm-7.30am daily.

Fido Australia (02) 959 3712. B & L Gatenby and R Morgan. 24 hours daily. V21, V22, V22bis. FidoNet 620/901.

First Nice MIDIline (02) 868 4347. P Andrew Khoo. V22, V22bis, Bell 103, Trailblazer. FidoNet node 711/805.

Galactic Federation (02) 233 5040. Kevin Galdwin. 5pm-9pm weekdays, 24 hours weekends. V22, V22bis.

Galaxy (02) 875 3943. MV. Chris Nelligan. 24 hours daily

GCS (02) 570 9861. Mark Ivanhoe. V21 V22.

Integra TEX (02) 746 1109. P. Kevin Leong. V22. FidoNet 712/703.

Ivory Tower (02) 668 8021 P. Colin Leslie V22, V22bis.

Kiwi Konektion (02) 439 6178. MV. Robert Earle. 6pm-8am weekdays. 24 hours weekends. V21. V22. V22bis. V23. FidoNet 711/410

Landover (02) 319 1793. MV. Lance Lyon. V21, V22, V22bis, V23, Bell 103, 212.

Lodestone (02) 456 3264. Ian McWhirter. V22, V22bis, Bell 103. FidoNet 711/407.

Lost Tavern (02) 938 6836. Sean Murphy.V21, V22

Manly (02) 977 6820. MV. V21, V22. V23. Requires Ultraterm or Rterm on C64.

Micro Design Lab (02) 663 0150. (02) 663 0151. MV. Kevin Lowton and Lindsay Gorrie.

Micro Mart C Users' (02) 560 3607. MV. Rick Polito. 24 hours daily. V21, V22, V22bis, V23.

Midnight Quest (02) 519 3579. P. Peter Pride. 5pm-9am weekdays, 24 hours weekends V21. V22. V23. Astronomy.

Milliway's (02) 357 7027 MV David Coucke. 9.30pm-7.30am daily V21. V22.

Moebius Trip (02) 439 7072 MV. Daniel Moran. 24 hours daily.

Nebula (02) 407 2729. MV. Sean Craig.

NetComm Australia (02) 887 3297. File Server. Bill Bolton. 6pm-8am weekdays. 24 hours weekends V22. V22bis PEP. Software support system for FidoNet sysops — file support only. Wazoo and Bark requests honoured. (In other words, don't bother dialling in as if this were a normal system!).

Nightmare (02) 545 1132 Todd Wright. V21, V22. V22bis, V23. FidoNet 712/503.

Night Shift (02) 635 8175 P 'Binky' 8.30pm-5am daily. V21. V22. V23, Bell 103, 212.

NSW Ace (02) 529 2059. MV. Larry O'Keefe. 24 hours daily.

Omen (02) 498 2495. P. Ted Romer 4.30pm-9am weekdays, 24 hours weekends. V21, V23.

Pandemonium (02) 411 7642. MV. Mark Farnan. V22.

Paragon (02) 597 7477. MV. Jennifer Allen. V21. V22, V22bis, V23. FidoNet 712/502.

PC Users Group — IBM Board (02) 724 6813. MV John Clarke. V21, V22, V23.

PC Users Group — Microcomp Board (02) 540 1842. MV. Bruce Edney. V21, V22 FidoNet 712/505.

PC Users Group — Westpac Board (02) 221 5520. MV Geoff May. V21, V22, V23.

Phantom Connection (02) 399 7716. MV. Bob James. 24 hours daily. Punternet node 5.

Playground (02) 53 9688. MV. Brett Selwood. V21, V22, V22bis, V23. FidoNet 712/504.

Poet's Dilemma (02) 804 6412. P John Della-Torre. V21, V22, V22bis, V23.

Program Paradise (02) 969 5861. M. Matthew Wood and Andrew Avery. 7pm-7am daily V21, V22, V22bis, V23.

Prophet (02) 628 5222. P. Larry Lewis. 24 hours daily. V21 V22. V22bis, V23. FidoNet node 713/606.

RCOM (02) 667 1930. MV. V21, V22. V23. V23 ORG. Bell 103, 212. Requires Ultraterm on C64.

Runway (02) 569 5130. MV. Colin Lean V21, V22, V22bis, V23. FidoNet 712/506

RUNX (02) 487 2464. MV. Mark Webster. 24 hours daily. V21. V22, V22bis, V23. Also on (02) 487 2533 (2 lines, V21 only); (02) 487 3677 (V22 only); (02) 489 3831 (V22bis only); (02) 487 2788 (V23 only). When offline, recorded system status message on (02) 487 2533. Voice enquiries on (02) 487 1299

SBA (02) 411 1850 MV Bob Wilson V22 V22bis FidoNet 711/406

Sci-Fi (02) 646 4865 P Greg Hope. 24 hours daily V21. V22. V23

Sendata (02) 438 4060. P Stephen Beeby. 24 hours daily V21. V22, V22bis, V23 Voice: (02) 438 4255.

Sentry (02) 428 4687. MV. Trev Roydhouse. 9pm-6am weekdays, 8pm-6am weekends V21. V22. V22bis, V23. FidoNet 711/401

Shore (02) 959 3936. MV David Gill and Jason Shar 6pm-7.30am weekdays 24 hours weekends

SMUG-Bee (02) 476 6396 MV Stephen Thompson V21 V22 V22bis. V23.

Software Connection (02) 451 2954 MV. Graeme Nichols. 24 hours daily V21 V22, V22bis, V23. FidoNet 711/404.

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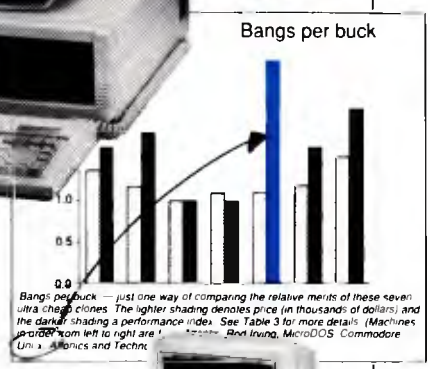

Bangs per buck — just one way of comparing the relative merits of these seven ultra cheap clones. The lighter shading denotes price (in thousands of dollars) and the darker shading a performance index. See Table 3 for more details. (Machines graded from left to right are [illegible] Red Irving, MicroDOS Commodore Unix, Atronics and Techno

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NEC. The Uni-x contains a NEC V20, manufactured by Sony. [illegible] Thus a V20 running at 4.77MHz will outrun an 8088 running at the same clock speed. [illegible] machines examined provided a standard PC clock rate of 4.77MHz as a minimum although the Uni-x delivered higher than standard performance even on this clock rate by virtue of the V20. The Atlantis [illegible] machines

Performance.
[illegible]. The Uni-x is fastest overall, providing a 50 per cent boost over the Technology Interface due to the V20. [illegible]

Display.
[illegible] delivered with a nice INTRA tilt/swivel amber screen. The [illegible]

Cost Effectiveness.
As you might expect, the do-it-yourself Uni-x comes up trumps with its low cost and relatively high performance. [illegible]

Specifics.
[illegible] very sensible [illegible] The Uni-x features a delightfully small motherboard. It has employed a VLSI component to replace the Intel 8253 timer, 8255 PPI, 8237 DMA controller and several other components. This reduced the component count and a simplified motherboard serves to reduce costs. [illegible]

see for yourself in the full Report in the October '87 issue, or ring us for a copy.

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Software Tools (02) 449 2618. MV. Bill Bolton. 24 hours daily. V22bis, Trailblazer FidoNet 711/403.
Sorceror Users Group (02) 626 8020. MV. John Cepak. V22, V22bis, Bell 103. FidoNet 711/405.
Tachyonics (02) 438 2682. MV. Richard Lenz. 24 hours. V21, V22. FidoNet.
TNT Shuttle (02) 319 3112. MV. Paul Birch. V21, V22, V22bis, V23, Bell 103, 212.
Trantor (02) 543 6899. Matthew Geier. V21, V22, V22bis, Bell 103, 212. A ringback system.
VIP (02) 319 3207.
Yet Another Bulletin Board (02) 804 6837. MV. Jonathan Chin. V21, V22, V22bis, V23, Bell 103, 212.
Your Computer (02) 669 1385. MV. Andy Farkas. 24 hours daily. FidoNet 712/622.
Zeta (02) 627 4177. MV. Nick Andrew. 24 hours weekdays, 7pm-7am weekends. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 713/602.
Abcom-dataLINK (047) 36 4165. MV. Ben Sharif 24 hours daily V21, V22, V22bis, V23. FidoNet 713/304.
BLAZE-dataLINK (047) 36 4825. MV. Lee Enfield. V21, V22, V22bis, V23. FidoNet 713/303.
Coastal (043) 23 2275. MV. Kevin Mann. V21, V22, V22bis, V23. FidoNet 711/430.
Comm-Link (043) 41 3135. MV. 'Nuggets'. 24 hours daily. V21, V22, V23. Bell 103, 212. Punternet node 9.
Freeze World (047) 33 3094. P. Ashley Irons. 9.30pm-7.30am daily.
HighTech (060) 25 1813. MV. Ross Wheeler. V21, V22, V22bis, V23, Bell 103, 212. Also packet radio. FidoNet 712/201.
Illawarra (042) 61 8230. MV. John Simon. 24 hours daily.
Library (049) 62 2931 P. Chris Ruwoldt. V21, V22, V22bis, V23. FidoNet 711/490.
Matrix Maitland (049) 38 5057. MV. Andrew Pike. V21, V22.
Mudgee Connection (063) 72 1898. P. George Rhedey. 9pm-7am daily. V21, V22, V22bis, V23. FidoNet 711/630.
Newcastle Amiga (049) 58 7099. P. Stan White. V21, V22, V22bis, V23.
Newcastle Micro Club (049) 68 5289. MV. Tony Nicholson. 5pm-8.30am weekdays. 24 hours weekends. V21, V22, V22bis, V23.
Palantir (060) 40 1284. MV. Steve Sharp. V21, V22, V22bis, V23, Bell 103, 212. Punternet node 1.
Sorcim Micros (065) 59 8854. M. John Caine. 9pm-8am daily. V22, V22bis, Trailblazer. FidoNet 711/405.
Steel City (042) 83 7247. MV. Craig Sinclair. 6.30pm-11.30pm daily. V21, V22, V22bis, V23. FidoNet 712/420.
Triops (063) 62 9715. P. 'Pdisk.' 9pm-6pm daily.

ACT

ACT Pharmacy (062) 92 3875. MV. Michael Pye. V21, V22, Bell 103, 212. FidoNet 626/223.
Commodore User Group (062) 81 0847. MV. James Hacker. 24 hours daily. Punternet node 2.
PC Exchange (062) 58 1406. MV. Phil Harding. 24 hours daily. V21, V22, V22bis, V23.
Professional Computer Users Group (062) 59 1244. MV. Alan Salmon. 24 hours daily. V21, V22, V22bis, V23. FidoNet 626/229.

Vic

ABE (03) 288 3599. P. Richard Gardiner. 24 hours daily. V21, V22.
Aces High (03) 878 2918. P. Daryl Harvey. 24 hours daily. V21, V22, V23.
Alpha Centauri (03) 874 3559. M. David and Kim Nugent. V22, V22bis. FidoNet 632/348.
Amiga Limits (03) 725 2895. MV. 'Captain Kirk.' V21, V22, V23.
AmigaLink (03) 792 3918. Bohdan Ferens. 24 hours daily. V21, V22, V23. FidoNet 631/324.
AM-NET (03) 366 7055. Peter Haligarten. 24 hours daily. V21, V23 and packet radio.
Angler's Den (03) 876 4118 6pm-10pm weekdays. 24 hours weekends. V21, V22, V23.
Anzugs (03) 887 0678 MV. Miklos Bolvary. V22, V22bis, Bell 103, 212 FidoNet 631/326.
Apple Hackers United (03) 762 1582. John Forbes. 24 hours daily.
AUSOM (03) 877 1990. MV. Grahame Willis. 24 hours daily.
AUSOM MacSIG (03) 435 9152. P. 24 hours daily. V21, V22, V22bis, V23.
Australian Pub With No Beer (03) 736 1814. MV. Grahame Mitchell. 10am-8pm daily. V21, V22, V23. FidoNet 632/350.
Big Tedd's (03) 509 6067. 'Big Tedd'. 9pm-8am daily.
Brainstorm (03) 758 7086. Rowan Stevens. V21, V22, V22bis, V23. Bell 103, 212 FidoNet 631/322.
C64-BBS (03) 489 4557. MV. Alan Miles. 24 hours daily.
Cave 76 (03) 882 9197. 'Avatar.' 6pm-10am daily. V21, V22, V22bis, V23.
Compusoft (03) 386 6019. P. George Tsoukas. 24 hours daily. V22.
Crystal Palace (03) 725 1923. Chris Brunton. V21, V22.
Crystal Symphony (03) 874 4176. MV. Greg Jones. 10pm-7am daily. V21, V22,

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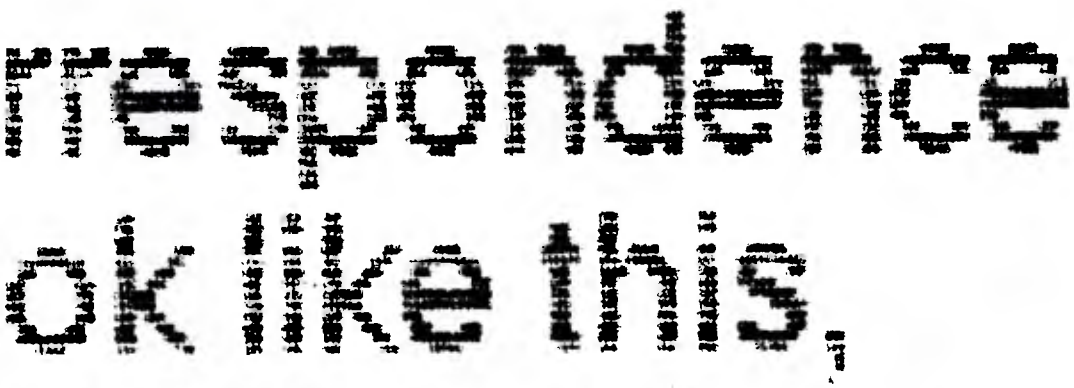

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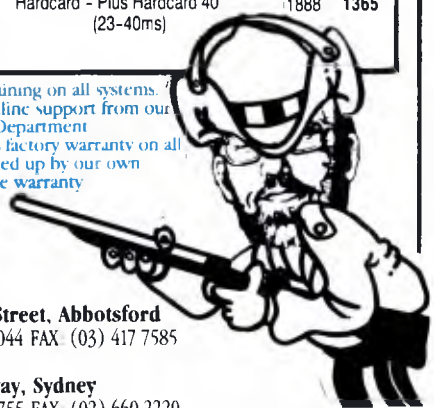

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laci. V21. V22.

Omen III (09) 276 2777. MV. Grey Watkins & Mark Dignam. 24 hours daily. V21. V22. V23.

Omen Mini (09) 279 8555. Grey Watkins. V21. V22. V23.

Pegasus (09) 242 2099. P. Michael Russell. 5pm-9am weekdays. 24 hours weekends. V21. V22. V22bis. V23.

Perth PC Users (09) 227 9229. 24 hours daily.

Student Access Message Service (09) 321 9721. MV. Peter Walton and John Bramley.

Treasure Island (09) 271 0471 Gloria Platt. V21. V22. V23.

Turing Circus (09) 385 2100. P. Phil Sutherland. V21. V22. V23. Bell 103. 212.

WA Atari Computer Enthusiasts (09) 306 2134. MV. Graham Basden V22.

West Coast (09) 445 3080. MV Mark Gaynor.

Z-Node 62 (09) 450 0200. Lindsay Allen. 24 hours daily.

Kalgoorlie College (090) 21 7755. P. Graham Clark. 24 hours daily. V21, V22, V22bis. V23.

TAS

Hobart Users (003) 43 5041. MV. Alan Hughes. V21. V22. V23. FidoNet 631/331.

Tassie Bread Board System (003) 26 4248. MV. Ian Campbell. 24 hours daily. V21. V22. V22bis. V23. FidoNet 630/330.

END

Submissions

The material in this column is presented in good faith, but as it is collated from material provided by readers, *APC* cannot take responsibility for its accuracy. New information and corrections are always welcome (but please mention whether or not you can vouch for accuracy of the material provided), and should be sent to:

Steve Withers, C/- Computer Publications, 47 Glenhuntly Road, Elwood, Vic 3184 or to Viatel mailbox 063000030.

Acknowledgements will be made through this column. You also may like to send a copy of the information to the Australian PAMS Coordinator at one of these addresses:
PO Box E41, Emerton, NSW 2770.
ACSnet: prophet@runx
Prophet BBS (02) 628 5222 (FidoNet 713/606).

TJ'S WORKSHOP

APC's monthly pot-pourri of hardware and software productivity tips. APC will pay between $100 and $200 for each tip published. Write to TJ's Workshop, APC, 124 Castlereagh Street, Sydney 2000.

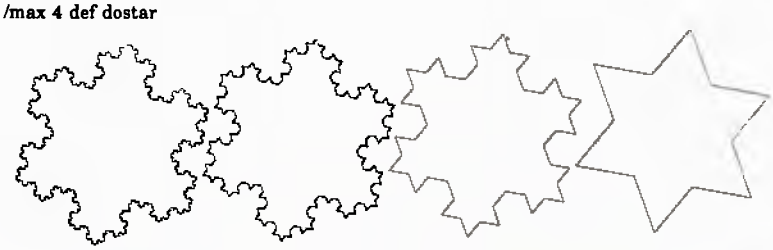
PostScript Koch Curve Snowflake Generator

When the Apple LaserWriter II was demonstrated in the *APC* office, it was probably one of the most powerful machines we'd ever seen — we even considered running *APC* Benchmarks on it! This little program allows any PostScript-compatible printer to be driven directly to produce output. It is best used with a word processor that allows embedded PostScript files.

If you send the file to the printer 'neat', you will need to send a 'showpage' command to print the page (see 'Getting more from PostScript', *APC*, May 1988). This program is intended simply to show the power and flexibility of PostScript as a programming language as well as a page description language.

S Day

```
%Postscript Koch Curve "Snowflake" Generator

%Constants
/third 1 3 div def              % Define one third to the limit of machine accuracy
/size 50 def                    % Define the side length to be used

%Procedures
/up                             % Increase depth of recursion
{  /level level 1 add def       % Increase depth counter
   third third scale            % and scale accordingly
} def

/down                           % Decrease depth of recursion
{  /level level 1 sub def       % (see "up")
   3 3 scale
} def
/doline                         % Draw the line segments making up the star
{  level max eq                 % Check the current depth of recursion
   {size 0 rlineto}             % Draw a line if at maximum depth
   {up doside} ifelse           % otherwise increase the depth and go round again
} def
/doside                         % Draw one unit of the pattern
{  doline                       %
   60 rotate doline             % Draw the individual line segments
   -120 rotate doline           % in the pattern unit
   60 rotate doline             %
   down                         % Completed one pattern unit so reduce the depth of recursion
 } def

/nextside                       %set scale and rotation
{  -120 rotate                  %for next side of star
   /level 0 def
   up
} def
/dostar
{  newpath                      % Clear the current path
   0 0 moveto                   % and move to the origin
   /level 1 def                 % Start at the lowest recursion level
   doside                       %
   nextside doside              % Draw all three sides of the star
   nextside doside              %
   nextside                     % Restore rotation and scale %for next star
   .1 setlinewidth              % Make the lines thin
   stroke                       % Draw this star
} def

% Main program                  % Draws four stars with increasing maximum
100 200 translate               % depths of recursion ofsetting the start
/max 1 def dostar               % position for each one
50 150 translate
/max 2 def dostar
50 150 translate
/max 3 def dostar
50 150 translate
/max 4 def dostar
```



Mixed bag

Below are a dozen small programs for the IBM PC and compatibles. Use a pure-ASCII word processor to type the individual scripts in Fig 1. Then, redirect the appropriate .SCR version of each one into DEBUG with a command like

```
DEBUG  BLANKINS.SCR
```

1. BLANKINS.COM — Blanks the screen temporarily by turning the colours to black on black without changing the on-screen text. Pressing the Ins key restores the original colours and text.

Format:

```
[d:] [Path]BLANKINS
```

You can change the key that reactivates things by patching address 12C. To change the restorative key to Shift-Tab and end up with a copy of the program called BLNKSHTB.COM, you'd type

```
DEBUG BLANKINS.COM
E 12c 0F
```

```
N BLANKINS.COM
E 100 B4 0F CD 10 3C 07 74 05 B8 00 B8 EB 03 B8 00 B0
E 110 8E D8 30 FF B4 08 CD 10 50 B4 03 CD 10 30 FF E8
E 120 10 00 30 E4 CD 16 3C 00 75 F8 80 FC 52 75 F3 58
E 130 88 E7 BE 00 00 B9 D0 07 88 7C 01 83 C6 02 49 85
E 140 C9 75 F5 B4 02 30 FF CD 10 C3
RCX
4A
W
Q


N BORDER.COM
E 100 BE 80 00 8B 0C 32 ED E3 31 FE C9 46 46 8A 1C 80
E 110 FB 30 72 1B 80 FB 39 76 10 80 E3 DF 80 FB 41 72
E 120 0E 80 FB 46 77 09 80 EB 07 80 EB 30 EB 06 90 E2
E 130 DB EB 07 90 B4 0B 32 FF CD 10 CD 20
RCX
3C
W
Q


N COLOR.COM
E 100 B7 FF BE 80 00 8B 0C 32 ED E3 4A 46 46 8A 04 3C
E 110 30 72 19 3C 39 76 0C 24 DF 3C 41 72 0F 3C 46 77
E 120 0B 2C 07 2C 30 80 FF FF 72 07 8A F8 E2 DE EB 25
E 130 90 8A D8 3A FB 74 1E B1 04 D2 E7 0A FB B8 00 06
E 140 B9 00 00 BA 4F 18 CD 10 B4 0F CD 10 B4 02 33 D2
E 150 CD 10 EB 08 90 BA 5E 01 B4 09 CD 21 CD 20
E 15E 0D 0A ' Enter two different hex foreground/background'
E 18E 20 'colors between 0-F (eg 71 or 4E)' 0D 0A 24
RCX
B2
W
Q


N COLOR2.COM
E 100 B7 FF BE 80 00 8B 0C 32 ED E3 4B 46 46 8A 04 3C
E 110 30 72 19 3C 39 76 0C 24 DF 3C 41 72 0F 3C 46 77
E 120 0B 2C 07 2C 30 80 FF FF 72 07 8A F8 E2 DE EB 26
E 130 90 8A D8 3A FB 74 1F B1 04 D2 E7 0A FB B8 00 B8
E 140 8E D8 BE 00 00 B9 D0 07 88 7C 01 83 C6 02 49 85
E 150 C9 75 F5 EB 08 90 BA 5F 01 B4 09 CD 21 CD 20
E 15F 0D 0A 20 'Enter two different hex foreground/background'
E 18F 20 'colors between 0-F (eg 71 or 4E)' 0D 0A 24
RCX
B3
W
Q
```

```
N COLORPIK.COM
E 100 B4 09 BA 85 01 CD 21 B7 00 B4 08 CD 10 88 E6 52
E 110 B4 0F CD 10 3C 07 74 05 B8 00 B8 EB 03 B8 00 B0
E 120 8E D8 E8 4E 00 30 E4 CD 16 3C 0D 75 03 5A EB 54
E 130 3C 1B 74 3E 3C 00 75 ED 80 FC 48 75 09 80 FE 7F
E 140 74 E3 FE C6 EB DC 80 FC 50 75 09 80 FE 00 74 D5
E 150 FE CE EB CE 80 FC 4B 75 0A 80 FE 10 72 C7 80 EE
E 160 10 EB BF 80 FC 4D 75 BD 80 FE 6F 77 B8 80 C6 10
E 170 EB B0 5A BE 00 00 B9 D0 07 88 74 01 83 C6 02 49
E 180 85 C9 75 F5 C3
E 185 'Press ',18,' and ',19,' to change foreground.',0D,0A
E 1AA 'Press ',1B,' and ',1A,' to change background.',0D,0A
E 1CF 'Then press Enter to save colors and quit.',0D,0A
E 1FA '(Or press Esc to abort and restore colors.)',0D,0A,24
RCX
128
W
Q


N COLRSHOW.COM
E 100 B0 01 50 30 FF B4 02 31 D2 CD 10 58 88 C3 88 C2
E 110 B1 04 D2 C2 38 C2 75 02 FE CB B4 09 B9 D0 07 CD
E 120 10 50 B4 07 CD 21 3C 00 75 2C B4 07 CD 21 3C 50
E 130 75 10 58 80 FB 01 75 05 B0 7F 50 EB C6 FE C8 50
E 140 EB C1 3C 48 75 DC 58 80 FB 7F 75 05 B0 01 50 EB
E 150 B2 FE C0 50 EB AD 3C 1B 74 10 88 C2 58 86 C2 3C
E 160 21 72 BF 3C 7E 77 BB 50 EB 99 58 CD 20
RCX
6D
W
Q


N CURSOR.COM
E 100 B7 FF BE 80 00 8B 0C 30 ED E3 31 46 46 8A 04 3C
E 110 30 72 1B 3C 39 76 0C 24 DF 3C 41 72 11 3C 46 77
E 120 0D 2C 07 2C 30 80 FF FF 72 08 88 C3 88 DF E2 DC
E 130 EB 0A 88 C1 88 DD B4 01 CD 10 EB 07 BA 45 01 B4
E 140 09 CD 21 CD 20
E 145 0D 0A 'Enter a two-digit hex number where the left'
E 172 20 0D 0A 'digit is the cursor start line and the right'
E 1A1 20 0D 0A 'digit is the stop line, eg 67 or BC.' 0D 0A 24
RCX
CB
W
Q


N CURSOR2.COM
E 100 30 FF B4 03 CD 10 51 B8 08 0C CD 21 3C 1B 74 32
E 110 3C 0D 74 35 3C 00 75 EF B4 08 CD 21 3C 48 74 0E
E 120 3C 50 74 0E 3C 4B 74 0E 3C 4D 74 0E EB D9 FE C5
```

continues . . .

Fig 1 DEBUG scripts for the programs described in the accompanying text. Use a pure-ASCII word processor to type them in. Then, redirect the appropriate .SCR version of each one into DEBUG with a command such as: DEBUG<BLANKINS.SCR

```
N BLNKSHTB.COM
W
Q
```

When you press Ins (or any other key you've used to restore the screen), BLANKINS.COM will reset the colours to the ones in effect at the cursor when you started the program. If you use lots of different colours on the screen at once, this won't restore them all.

BLANKINS.COM is hard-wired for 80 by 25 screens only. It restores the colour by filling every other byte in video memory with the desired attribute value.

2. BORDER.COM — Sets border colour from the command line on CGA or CGA-compatible screens.

Format:

```
[d:] [path]BORDER n
```

where *n* corresponds to the hex value of a border colour from 0 through F.

IBM doesn't support border colours on any systems other than the CGA. However, if you are using a CGA you may choose any border colour from 0(black) to F(bright white). Note: this will change the screen colours rather than the border in Basic graphics screens 1 and 2. To change the low-resolution background colour to red, for instance, load Basic, type SCREEN 1, and then enter

```
SHELL ''BORDER 4
```

3. COLOR.COM — Sets foreground and background colours from the command line and clears the screen to those colours. The COLOR2.COM program below sets colours but doesn't clear the screen.

Format:

```
[d:] [path]COLOR bf
```

where *b* is a background colour and *f* is a foreground colour.

Enter two different hex numbers from 0 through F, where *f* is the foreground and *b* is the background. If you enter anything else, COLOR.COM will print instructions on how to use it.

You may enter alphabetical hex digits in either uppercase or lowercase. Digits may be separated by spaces, commas, or any other characters, or entered next to each other. Entering a background higher than 7 will make the foreground blink.

4. COLOR2.COM — Sets foreground

```
E 130 EB 0A FE CD EB 06 FE C1 EB 02 FE C9 B4 01 CD 10
E 140 EB C5 59 B4 01 CD 10 EB 0E 89 CA 59 39 CA 75 07
E 150 B4 09 BA 58 01 CD 21 C3
E 158 'Press ',18,' and ',19,' to change start line.',0D,0A
E 17D 'Press ',1B,' and ',1A,' to change end line.',0D,0A
E 1A0 'Then press Enter to save any changes',0D,0A
E 1C6 '(or Esc to quit without changing).'0D,0A,24
RCX
EB
W
Q


N PAGE.COM
E 100 B4 0F CD 10 3C 03 75 51 BE 80 00 8B 0C 32 ED E3
E 110 17 46 46 8A 04 3C 3F 74 2B 3C 30 72 09 3C 33 77
E 120 05 2C 30 EB 0D 90 E2 EA BA 64 01 B4 09 CD 21 EB
E 130 28 90 B4 05 CD 10 B4 03 CD 10 80 EE 01 B4 02 CD
E 140 10 EB 16 90 BA 5B 01 B4 09 CD 21 B4 0F 8A D7 80
E 150 C2 30 B4 02 CD 21 EB 01 90 CD 20
E 15B 'Page is $'
E 164 'Enter page 0-3 or ? for current.page$'
RCX
89
W
Q


N PAGECLS.COM
E 100 B4 0F CD 10 B4 08 CD 10 53 8A FC B8 00 06 B9 00
E 110 00 BA 4F 18 CD 10 B4 02 5B 33 D2 CD 10 CD 20
RCX
1F
W
Q


N REBOOT.COM
E 100 B4 09 BA 31 01 CD 21 B8 08 0C CD 21 3C 1B 74 20
E 110 24 DF 3C 43 74 09 3C 57 75 ED BB 34 12 EB 03 BB
E 120 7F 7F B8 40 00 8E D8 89 1E 72 00 EA 00 00 FF FF C3
E 131 'Warm or Cold boot (W/C)? -- or Esc to abort:  $'
RCX
60
W
Q


N ROMINFO.COM
E 100 B4 09 BA 84 01 CD 21 1E BA 00 F0 8E DA B9 08 00
E 110 BB F5 FF 8A 17 B4 02 CD 21 43 E2 F7 1F B4 09 BA
E 120 A8 01 CD 21 1E BA 00 F0 8E DA B9 0E 00 BB 08 E0
E 130 8A 17 B4 02 CD 21 43 E2 F7 1F B4 09 BA CF 01 CD
E 140 21 1E BA 00 F0 8E DA BB FE FF 8A 17 88 D6 80 E2
E 150 F0 B1 04 D2 EA 80 E2 0F 80 C2 37 80 FA 41 7D 03
E 160 80 EA 07 B4 02 CD 21 80 E6 0F 80 C6 37 80 FE 41
E 170 7D 03 80 EE 07 88 F2 B4 02 CD 21 1F B4 09 BA F3
E 180 01 CD 21 C3
E 184 0D 0A 'ROM date at address F000:FFF5 is $'
E 1A8 2E 0D 0A '(C) notice at address F000:E005 is $'
E 1CF 2E 0D 0A 'ID Byte at address F000:FFFE is $'
E 1F3 2E 0D 0A 24
RCX
F7
W
Q
```

Ends

and background colours from the command line but leaves the contents of the screen intact.

Format:
`[d:] [path]COLOR2 bf`

where *b* is a background colour and *f* is a foreground colour.

While the above COLOR.COM program clears the screen when it sets the colours, it doesn't disturb the screen contents. It does so by writing to the attribute bytes in video memory and assumes an 80 by 25 screen at segment B800h.

As with COLOR.COM, you must enter two different hex numbers from 0 through F, where *f* is the foreground and *b* is the background. Enter anything else and COLOR2.COM will simply print instructions on how to use it.

5. COLORPIK.COM — Lets you change screen colours by pressing arrow keys.

Format:
`[d:] [path]COLORPIK`

Pressing the Left and Right Arrow keys cycles through all available colours. Pressing the Up and Down Arrow keys cycles through the eight available background colours — without clearing the screen.

When you see the colour combination you want, just press the Enter key to lock it in and exit.

If you want to abort the process and restore your original colours, press Esc. Since the program lets you use the same foreground and background colours, which makes any text on the screen invisible, pressing Esc will put everything back to normal. This program is hard-wired for an 80 by 25 screen.

6. COLRSHOW.COM — Shows all possible different foreground-background colour combinations on colour systems.

Format:
`[d:] [path]COLRSHOW`

With 16 possible foreground colours and eight possible background colours, you can mix and match 128 colour combinations. COLRSHOW.COM uses BIOS INT 10 service 9 to show them all. (Actually, it shows only 120, since it skips any combinations that have the same background and foreground colours.)

Since it needs to print something in the foreground, it fills the entire screen with the ASCII character that happens to have the same value as the colour attribute shown.

When you first run it, COLRSHOW will fill the screen with ASCII character 01 smiling faces. Since the colour attribute that has the same value as the character shown — 01 — is blue (colour 1) on black (colour 0), the screenful of faces will appear in blue on black.

You can press the Up Arrow Key repeatedly to increase the value of the character shown (as well as the colour it's shown in), or the Down Arrow key to decrease this value. Or you can type in any letter other than a space to fill the screen with that character in the colour that matches its ASCII value. (Typing in a space wouldn't show anything other than a green background.)

For instance, typing a 't' will fill the screen with red lowercase 't' characters on a white background, since the hex value of 't' is 74, and the colour attribute 74 is red(4) on white(7).

Pressing the Up Arrow repeatedly will fill the screen with blue ASCII 01 characters, then green ASCII 02 characters, then cyan ASCII 03 characters, etc. Pressing the Down Arrow repeatedly will display these characters in descending order. If you reach the top or bottom of the list of possible values, the program will let you cycle through them all again.

Pressing Esc will quit. The screen colours you last selected will remain in effect.

7.CURSOR.COM — Sets cursor shape.

Format:
`[d:] [path]CURSOR se`

where *s* is the cursor-starting scan line and *e* is the cursor-ending scan line, in hex notation.

A monochrome display uses 14 scan lines for each character, 0-13. A CGA (and, for all practical purposes, an EGA) uses 8 scan lines, 0-7.

While the EGA character box has 14 lines, most programs designed to work on colour systems assume an 8-line box. Using the default colour scan lines 6 and 7 on an EGA would normally result in a cursor blinking somewhere in

the middle of the character box. The EGA BIOS's built-in cursor emulation logic translates the normal cursor size into something more appropriate for a 14-scan-line character.

The CURSOR.COM number to enter for the default monochrome cursor is BC (starting at scan line hex 0B, or decimal 11, and ending at scan line hex 0C or decimal 12). The number for the default CGA cursor is 67 (starting at scan line 6 and ending at scan line 7).

You can change the size and shape of the cursor by specifying new starting and ending values. A low starting line and a high ending line yields a block cursor. You can also end up with unusual shapes by making the starting line higher than the ending line. Entering the default values will bring the cursor back to normal.

8. CURSOR2.COM — Lets you create any cursor shape you want interactively by pressing the arrow keys.

Format:
```
[d:] [path]CURSOR2
```

CURSOR2.COM gives you an easy way to see what cursor shapes are possible, with the option of changing your current cursor.

When you first load the program, the current cursor drops down one line. Pressing the arrow keys will change the cursor shape as follows:

Up Arrow	Increase starting line
Down Arrow	Decrease starting line
Left Arrow	Increase ending line
Right Arrow	Decrease ending line

Each time you press an arrow key, the value changes by 1 in the direction indicated. If you like what you see, you can press the Enter key, which will lock in the currently displayed value and then exit.

However, since many values will either make your cursor disappear entirely or produce something that you can't possibly use, you may press Esc to abort the process and the program will restore your original cursor.

If you load CURSOR2 and then press Enter without making any changes, the program will display instructions.

9. PAGE.COM — Switches among text pages 0 and 3 on a colour system and identifies the current video page.

Format:
```
[d:] [path]PAGE n | ?
```

where *n* is an 80 by 25 text mode video page number, and ? is a parameter that reports the current page being worked on. You may use only one of these variables at any given time.

Entering a page number from 0 to 3 will make that video page active. Entering a ? will display the current page. The BIOS default page (the one in which most users commonly work) is page 0. Entering a page number out of range won't do anything.

A limitation is that this will work only on colour systems and only in the 80 by 25 colour text mode. You can use screen pages to store information — such as directory listings — and treat these other pages almost as text windows.

10. PAGECLS.COM — Clears any 80 by 25 screen to the existing screen colours and on the current video page.

Format:
```
[d:] [path]PAGECLS
```

Most CLS utilities assume you want to clear the screen to preset colours and on video page 0. This program looks at the existing colours and maintains those colours when it clears the screen, and it will clear whatever page happens to be active without disturbing any other video pages.

11. REBOOT.COM — Lets you select a warm boot or a cold boot, or abort the rebooting process.

Format:
```
[d:] [path]REBOOT
```

This is a very simple program that prints a short message on-screen and gives you three options. You can:

1. Press C or c for a cold boot
2. Press W or w for a warm boot
3. Press Esc to abort and return to DOS.

The program ignores any other keypresses.

Warm boots and cold boots are almost identical, except that a cold boot performs an additional power-on-self-test (POST) as if you had turned the main power switch off and on, while a warm boot skips these tests as if you had pressed Ctrl-Alt-Del.

When a PC boots, its BIOS checks a flag word (2 bytes) at location 40:72. If the value of the flag is hex 1234, BIOS does a warm boot. If the flag is not 1234, BIOS does a cold boot. Once you boot up, it puts a 1234 there so subsequent Ctrl-Alt-Del warm boots can skip the POST.

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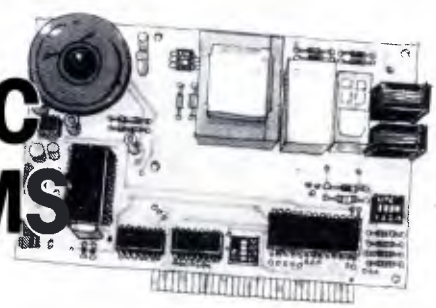
MOSAIC MODEMS



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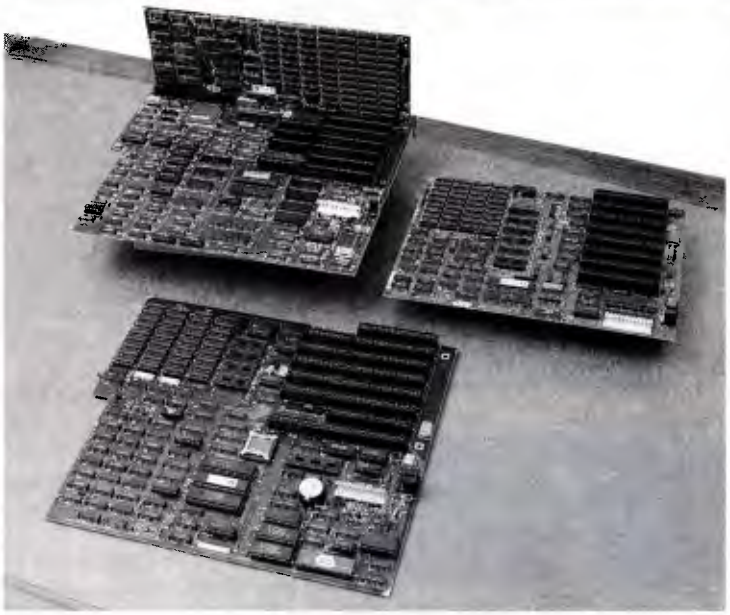
For more information about the magic software-Maximem, please contact us any time.



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If you use DEBUG to look at addresses 40:72 and 40:73, you'll see 34 12 rather than 12 34 since the PC stores words in 'backwords' order. The high-order byte (12) goes into the higher memory address (40:73), while the low-order byte (34) goes into the lower memory address (40:72). Despite this, the word take the lower memory address as its own.

12. ROMINFO.COM — Reports the date, copyright notice, and ID byte information embedded in most ROM BIOS chips.

Format:

```
[d:] [path]ROMINFO
```

IBM changes the BIOS with each new system. Some older BIOS chips had serious problems. For instance, the BIOS in an original PC prevents it from booting off a hard disk. And most systems have gone through several revisions. (See the table 'IBM hardware releases'.)

Fortunately, IBM socketed its ROM chips to let you upgrade them. Unfortunately, it also stopped selling some of the upgrade ROMs. If you're trying to install a hot new piece of hardware on an old system and it doesn't work, one reason could be a ROM that needs upgrading.

You can use ROMINFO.COM to sniff out the date (which IBM calls the 'release marker'), the copyright notice, and the machine ID byte. If it tells you that you're using an older ROM, you might be able to have your dealer switch ROM chips with someone who doesn't need the newer one.

The ID byte is a single value at the very top of memory that some software uses to determine the kind of hardware it's dealing with.

This program looks at three specific ROM addresses. The ID byte should be at the same place in most systems, but the copyright notice and perhaps even the ROM 'release marker' may not. If not, the program will print whatever characters happen to be at those addresses and you may end up seeing garbage on non-IBM systems.

IBM hardware releases

ROM date	ID	System
04/24/81	FF	IBM PC (collector's item)
10/19/81	FF	IBM PC (bugs fixed)
08/16/82	FE	IBM PC-XT (first one)
10/27//82	FF	IBM PC handling hard disk and 640k
11/08/82	FE	IBM Portable PC, XT
06/01/83	FD	IBM PC*jr*
01/10/84	FC	IBM PC AT
06/10/85	FC	IBM PC AT (rev 1)
09/13/85	F9	IBM PC Convertible
11/15/85	FC	IBM PC AT with speed governor, 30Mbytes hard disk, Enhanced keyboard (submodel 1)
01/10/86	FB	IBM PC-XT (rev 1)
04/21/86	FC	IBM PC-XT Model 286 (submodel 2)
05/09/86	FB	IBM PC-XT (rev 2)
09/02/86	FA	IBM PS/2 Model 30
02/13/87	FC	IBM PS/2 Model 50 (submodel 4)
02/13/87	FC	IBM PS/2 Model 60 (submodel 5)
03/30/87	F8	IBM PS/2 Model 80 (16MHz)
10/07/87	F8	IBM PS/2 Model 80 (20MHz)

The ROM date is at address F000:FFF5. The copyright notice is at address F000:E005 and the ID byte is at address F000:FFFE.

Include file curiosity

When compiling a standalone program using QuickBASIC 3.0, the length of the .EXE file produced depends partly on the *order* of the various subprograms in the Basic source code. For example, I have one program whose main module, along with several $Include subprogram files, total 5700 lines. I had placed all of the $Include statements at the end of the main program. Moving the $Include statements to the beginning of the main program shortened the .EXE file from 160k to 158k. A bit of experimenting moving subroutines around may yield an even smaller final .EXE program size.
N Swartz

That *isD interesting. Even more interesting is the fact that Microsoft had no ready explanation either, other than suggesting that perhaps one of the $Include files contains a $Dynamic metacommand. In that case, any subsequent dimension statements will create code to set aside memory for arrays at run-time, rather than including the memory for arrays into the EXE file — EW.*

Seeking text files

Turbo Pascal provides a convenient means of reading from text files with the standard procedures Read and ReadLn. Any text represented by ASCII characters can be read from a text file.

Part of the price paid for that convenience and flexibility is that Turbo Pascal does not support random access I/O on text files. That is, when the file pointer is at the start of the file and your

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program needs the 50th line, it must make a total of 50 calls to ReadLn!

Of course, in a typed file, Turbo could calculate the offset of the 50th record and move the file pointer directly there. Why not use a file of strings if you need random access of text-like material? One reason: you must declare the length of strings before you can use them, and a file of strings will allocate the full length for each string. Another: you still wouldn't be able to use ReadLn to access those files.

In many text file applications, the lack of random access is no handicap. Some applications, however, cry out for both the speed of random access and the flexibility and ease of Read and ReadLn, eg, a file of random-length ASCII records, such as a mailing list, or a help file, with subject matter of varying length. Wherever you want to start reading a text file somewhere in the middle, Turbo Pascal comes up short.

But when Turbo taketh away, it giveth as well: it allows one variable to be declared as absolute to another variable. This forces these two variables to start at the same memory location. A file is simply another variable, and a text file looks remarkably similar to a file of BYTE — enough so that a file of BYTE can be declared as absolute to the text file.

Turbo Pascal, versions 2.x and 3.x, manage files using a File Interface Block (described on page 220 of the Turbo Pascal 3.0 Reference Manual, first edition). When you declare a file variable, Turbo allocates space for an FIB and assigns it to that file variable.

The only significant difference between the FIB of a text file and that of a file of BYTE, so far as I can tell, is in the value of the 'record length' field. This value is 1 for the file of BYTE, but it is not constant for the text file. The low byte of the text file record length holds the flags with information about the file, and the high byte contains a read-ahead buffer. To make Turbo treat a text file like a file of BYTE, you only need to set the record length to 1 and tell Turbo to operate on the byte file. Be sure that you restore the record length byte before letting Turbo know that the file is really text! To force text input from the new location addressed by the file pointer, you must do a little more manipulation: set the buffer pointer equal to the end of the buffer, which will force the next Read or ReadLn to refill the buffer from the current location in the file.

I've written the function SeekToText to enable random access of text files.

```
PROGRAM SeekToTextDemo;

  FUNCTION SeekToText(VAR TextFile : Text; OffSet : Real) : Integer;
  TYPE {see the Turbo Pascal 3.X reference manual for the FIB layout}
    FIBtype = RECORD
      Handle, RecLength, BufOff, BufSize, BufPtr, BufEnd : Integer;
      FilePath : ARRAY[1..64] OF Char;
    END;            {FIBtype}
  VAR
    ByteFile : FILE OF Byte ABSOLUTE TextFile;
    FIB      : FIBtype ABSOLUTE TextFile;
    SaveRL   : Integer;
  BEGIN                          {SeekToText}
    WITH FIB DO
      BEGIN
        SaveRL := RecLength;     {RecLength actually holds flags and}
                                 {maybe a char from the text file}
        RecLength := 1;          {A byte file "record" is one byte}
        {$I-} LongSeek(ByteFile, OffSet); {$I+}
        SeekToText := IOResult; {The caller must deal with IO errors}
        RecLength := SaveRL;     {restore values for the text file}
        BufPtr := BufEnd;        {force next Read/ReadLn to refill buffer}
      END;
  END;                           {PROCEDURE SeekToText}

VAR
  DemoFile : Text;
  i, j     : Integer;
  MaxLine  : STRING[255];
CONST
  DFOffsets : ARRAY[1..4] OF Real = (95, 0, 143, 43);
  DFName = 'DEMOFILE.TXT';

BEGIN                            {SeekToTextDemo}
  Assign(DemoFile, DFName);
  {$I-} Reset(DemoFile);         {$I-}

  IF IOResult <> 0 THEN
    BEGIN
      WriteLn('Failed to open ', DFName);
      Halt(IOResult);
    END;                          {if IOResult <> 0}
  FOR i := 1 TO 4 DO
    BEGIN
      j := SeekToText(DemoFile, DFOffsets[i]);
      IF j <> 0 THEN
        BEGIN
          WriteLn('SeekToText failure with DFOffsets[', i, ']');
          Halt(j);
        END {j <> 0}
      ELSE
        BEGIN   {j = 0}
          ReadLn(DemoFile, MaxLine);
          WriteLn(MaxLine);
        END;                        {j = 0}
    END;                           {for i := 1 to 4}
  WriteLn;
  {$I-} Close(DemoFile);         {$I-}
  IF IOResult <> 0 THEN
    BEGIN
      WriteLn('Failed to close ', DFName);
      Halt(IOResult);
    END;                           {if IOResult <> 0}
  WriteLn('All operations concluded successfully.')
END.
```

Fig 2 How to SEEK to a certain offset in a text file

```
First line of the demo file: Karl Brendel
Second line:                 Anyoldtown, KS  12345
Third:                       Mookraker Systems
Absolutely the last line :   123 East A Avenue
```

Fig 3 Contents of DEMOFILE.TXT, used by the program SeekToTextDemo

```
{$R+,C-}
PROGRAM FileDateAndTime;

TYPE
  Str10 = STRING[10],
  Str2 = STRING[2];
  FlagType = (CarryFlag,      NoFlag0002,
              ParityFlag,     NoFlag0008,
              AuxCarryFlag,   NoFlag0020,
              ZeroFlag,       SignFlag,
              StepTrapFlag,   InterruptFlag,
              DirectionFlag,  OverflowFlag,
              NoFlag1000,     NoFlag2000,
              NoFlag4000,     NoFlag8000);
  FlagSet = SET OF FlagType;
  RegisterType = RECORD CASE Byte OF
    0   (AX, BX, CX, DX, BP, SI, DI, DS, ES, Flags : Integer);
    1   (AL, AH, BL, BH, CL, CH, DL, DH : Byte);
    2   (RegArray : ARRAY[1..9] OF Integer;
         FlagRegister   FlagSet);
                END;
VAR
  Registers                         RegisterType;
  FileDate, FileTime, FileYear      Integer;
  FileMonth, FileDay, FileHour,
  FileMinute, FileSecond            Byte;
  FileDateString, FileTimeString    Str10;
  AFile                             FILE;

  PROCEDURE InterpretFileDateAndTime(VAR AnyFile; VAR FDate, FTime
  CONST GetFileDateAndTime = $5700;
  VAR HandleNumber : Byte ABSOLUTE AnyFile;
    YearString : Str10;

    FUNCTION ZeroFill(InByte   Byte) : Str2
    VAR ZF : Str2;
    BEGIN
      Str(InByte:2, ZF);
      IF ZF[1] = ' ' THEN ZF[1]  := '0',
      ZeroFill := ZF;
    END;                        { Function ZeroFill }

  BEGIN
    WITH Registers DO
      BEGIN
        AX    GetFileDateAndTime;
        BX := HandleNumber;
        MsDos(Registers);
        IF CarryFlag IN FlagRegister THEN
          BEGIN
            FileDateString := 'Invalid',
            FileTimeString :=  Handle',
          END
        ELSE
          BEGIN
            FileDate := DX;
            FileTime := CX;
            FileYear :=  ((FileDate AND $FE00) SHR 9)+1980;
            FileMonth := (FileDate AND $01E0) SHR 5;
            FileDay := (FileDate AND $001F);
            FileHour := (FileTime AND $F800) SHR 11;
            FileMinute := (FileTime AND $07E0) SHR 5;
            FileSecond :=  (FileTime AND $001F),
            Str(FileYear:4, YearString);
            FDate := ZeroFill(FileMonth)+ '/'+
            ZeroFill(FileDay)+'/'+
            YearString;
            FTime := ZeroFill(FileHour)+':'+
            ZeroFill(FileMinute)+':'+
            ZeroFill(FileSecond);
          END;
      END;
  END;                          { Procedure InterpretFileDateAndTime }

BEGIN
  Assign(AFile, 'FDT.PAS'),
  {$I-} Reset(AFile);           {$I+}
  IF IOResult = 0 THEN
    BEGIN
      InterpretFileDateAndTime(AFile, FileDateString, FileTimeString);
      Close(AFile);
      WriteLn(FileDateString, '  ', FileTimeString);
    END
  ELSE
    WriteLn('Where''s FDT.PAS?'),
END.
```

Fig 4 File date/time routine, using improved RegisterType, which works in Turbo Pascal, version 3.0

SeekToText takes a text file and an offset as parameters and attempts to locate the file's pointer at the offset, in bytes. It returns the value of Turbo's IOResult following the attempt. A program using SeekToText need only $Include it.

The little program SeekToTextDemo (Fig 2) uses the function to unscramble the lines containing my name and address from DEMOFILE.TXT (Fig 3), using offsets stored in the constant array DFOffsets. I got the values in the array by counting characters in a text editor (remembering to count line ends as two characters). In a real application, you would let the program determine the offsets.

K Brendel

I picture using this technique on a file of help texts, as Mr Brendel suggested. You might use a separate utility program to calculate the offset of each new paragraph of help text and save the offsets to an index file. Then your main program could jump directly to the correct spot in the help text and display the appropriate paragraph. Nice! But note that this technique is good only for Turbo Pascal, versions 2 and 3 — it won't work in the new version 4 — NR.

File date and time

The program FileDateAndTime (Fig 4) demonstrates a procedure to construct two strings with the Date and Time of any open file. I've incorporated it into a number of programs since its original development for a Pascal source lister.

I like to set up constants to make programs more readable. For example, DOS function names like 'GetFileDateAndTime = $5700', interrupt names like 'VideoInterrupt = $10', interrupt functions like 'RequestVideoMode = $0F', and so forth.

This program includes an 'extended

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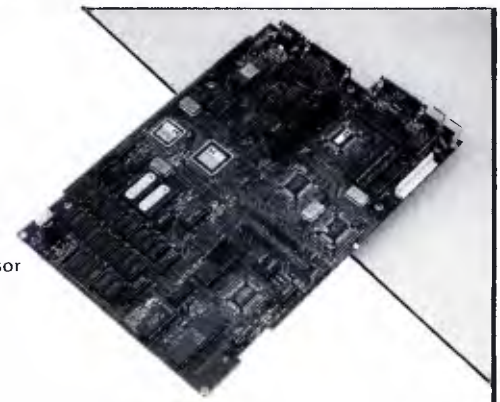

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definition' of the 8086/8088 registers, using a Turbo Pascal SET to allow testing flags by name. 'CarryFlag in FlagRegister' is clearer than 'Odd(Flags)' is. Of course, if you're testing the Zero Flag, the difference is even more significant. 'ZeroFlag in FlagRegister' is a lot better than either '(Flags and $40) = 0' or 'Odd(Flags shr 6)' is. Another advantage is that you avoid coding errors like 'Odd(Flags shr 5)' when you are able to test a flag by name.

B Berry

I highly approve of Mr Berry's modified RegisterType. You have to check the flags after most DOS calls to be sure the operation succeeded. Using the SET type shown here, the flag-checking code will be much more readable.

This procedure takes advantage of the fact that Turbo Pascal determines the presence or absence of members in a set by checking if bits are on or off. The FlagSet TYPE corresponds exactly to the bit layout of the Flags word, so having member N in the set corresponds to bit N being ON — NR.

Missing device drivers

Recently, I added the statement

```
DEVICE=VDISK 128 512 32
```

to the CONFIG.SYS file on my PC-XT. I was delighted with the increased speed of disk operations on the RAMdisk. Everything worked fine until I needed all of my 640k to run *R:base*. To recover the necessary memory, I took the DEVICE=VDISK statement out of the CONFIG.SYS file and rebooted. After finishing with *R:base*, I tried to recreate the RAM drive, but received a 'Bad or Missing VDISK' error message.

I'm having the same problem with our PC AT at work. Both systems are running DOS 3.3. First I had a RAMdisk on both systems, but now I can't get it going on either. The DOS documentation is no help. Can you tell me what is *not* happening?

B Douglas

One of the things that make using a computer so frustrating is that for no apparent *reason things just stop working. Yet you know that there really* must be *a reason. Solving the mystery requires examining the situation to determine specifically what is occurring and what is causing the problem, and correcting the cause.*

The first step is always to consult the manual. An explanation of the message 'Bad or missing >filename@' is given in Appendix A of the DOS manual. This message, issued by DOS during start-up (booting) when it reads and processes the CONFIG.SYS file, indicates that the device driver file named in the DEVICE= statement could not be found.

To determine why the file could not be found, check the syntax for the DEVICE= statement. The DOS manual gives

```
DEVICE=[d:]
[path]filename[.ext]
```

where the parameters shown in brackets are optional but have default values. If no drive is specified with the [d:] parameter, DOS substitutes the current drive. Similarly, if the [path] argument is not used, the root directory will be assumed. There is no default device driver name, so this must be *specified.*

The 'filename.[ext]' parameter is, however, very misleading and provides an example of how reading a manual can be counterproductive. The extension parameter ([.ext]) is shown as optional and separate from the filename when, in reality, it is neither. The full filename, including extension, must always be specified. The DEVICE= statement in Mr Douglas' letter will fail because the correct device driver name is VDISK.SYS, not VDISK. Unlike executable programs, no default file extension is assumed by DOS when processing the CONFIG.SYS file.

In addition to changing the DEVICE= line in the CONFIG.SYS file, check to see that the VDISK.SYS file hasn't accidentally been erased from the root directory. If the file isn't present, it won't load — even with the correct syntax! — RH.

Mixing operating systems

We would like to set up a network running different operating systems on the same cards. Ideally, we want at least three different network operating systems, including NetWare, 3+Share, and Tapestry, using 3Com EtherLink cards. I would appreciate any suggestions you may have.

H Halasz

You won't have a problem mixing these operating systems on the same hardware. I'm sure you understand that each workstation runs only one brand of LAN operating system at a time. However, Tapestry workstations can interact with Tapestry servers at the same

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time and on the same cable while 3+Share workstations interact with 3+Share servers, and so on.

NetWare comes with selections in the workstation and server configuration menus for the 3Com cards. 3Com's 3+Share is ready to run on the 3Com hardware. The standard version of Tapestry runs over the NetBIOS interface software. It's important to make sure you get NetBIOS from 3Com with the EtherLink cards. Don't try to use a NetBIOS program that Quadram or other vendors distribute with Tapestry, because each vendor's NetBIOS is customised for specific hardware.

When you want to run a NetBIOS-compatible network operating system like Tapestry, IBM's PC LAN, or LANtastic, read in the 3Com NetBIOS software from a batch file and then start the networking software.

We boot all our workstations from a floppy disk so we can have the right assignment of buffers, files, and drives in the CONFIG.SYS file for each operating system. Changing network software is as easy as changing diskettes. Label each boot diskette carefully, and you will have a very flexible LAN development system — FD.

Using APPEND with BasicA

I have discovered a problem that occurs when using the DOS 3.3 APPEND command and BasicA If I have APPEND loaded and execute the demonstration Basic program shown in Fig 5, the file FILEA.TXT, located in a directory that is included in my APPEND path, will be overwritten by the Basic program. Although the program should create a new file in the \TMP directory, it doesn't.

If there is no existing file named FILEA.TXT along an APPEND path, then things will work as expected. Otherwise, important data is at risk.

D Bartholomew

The APPEND command carries with it several caveats of which users need to be aware — this is one of them. APPEND loads as a TSR and monitors all DOS file open requests. When a file open request is processed and the file cannot be found, APPEND then steps in and attempts to find a file of the same name in any of the subdirectories in its 'path'. If it finds one, it substitutes it for the requested file. The calling application never even knows that this has happened.

This substitution, however, can be dangerous in certain situations. The problem lies with the way BasicA determines whether it should try to open an existing file or create a new one. The same Basic language statement, the 'OPEN' statement, is used for both.

When BasicA processes the 'OPEN' statement, it uses a two-step approach. First, it assumes that the file exists and attempts to open it using the DOS open file handle *function. Then, if the file does not exist, it creates it using the DOS* create file handle *function.*

This process works just fine without APPEND. With APPEND loaded, however, instead of failing because the requested file doesn't exist, the open file handle function can be satisfied by any *file of the same name* anywhere *in the APPEND path. This makes deliberately creating a new file difficult if one with*

```
10 OPEN "\TMP\FILEA.TXT" FOR OUTPUT AS #1
20 PRINT #1, "Creating \TMP\FILEA.TXT"
30 CLOSE
40 SYSTEM
```

Fig 5 A sample Basic program that demonstrates a potential problem using APPEND with BasicA

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the same name already exists somewhere in the APPEND path — because Basic will never get to step two of its two-step sequence for opening a file

The best solution is to not use the APPEND command. And you don't have to if your application supports subdirectories. APPEND's main purpose is to provide subdirectory access to applications that were written before DOS 2.0. But if you must use APPEND, try the following.

If the intent is to create a brand-new file, precede the OPEN statement with an OPEN 'filename' FOR INPUT statement. If this call fails (trap the error using ON ERROR), you can assume the file does not exist in the current directory or in the APPEND path. If the call succeeds, a file with that name exists somewhere in the APPEND path, and caution is needed.

What if you want to update the file \TMP\FILEA.TXT if it exists, but create it if it doesn't? Unfortunately, with APPEND loaded, there is no way of knowing whether a successful OPEN has opened the requested file or one somewhere in the APPEND path. The Basic program must take responsibility for retrieving the APPEND path from the DOS environment and searching through it for files of the same name before attempting to open the file. To make this step possible, the APPEND command provides the /E option, which causes the APPEND path to be placed in the DOS environment. From there, it can be retrieved using the Basic ENVIRON command.

The DOS reference manual's explanation of APPEND implies that reading a file, then writing it, may not write the file in the expected directory. It also cautions against using the DOS APPEND command from either the IBM PC Network Program version 1.00, or the IBM PC Local Area Network Program, version 1.10. Users of APPEND would be wise to read the DOS manual section on APPEND thoroughly before using it in their applications — SR.

Creating custom fonts

One of the powerful capabilities of the Epson FX series of dot matrix printers is their ability to download and use custom character fonts. These new characters replace those in the existing set. Greek letters or special symbols, for example, may be included in a document.

Custom characters are defined in terms of the printhead pin numbers needed to produce them. The printhead can be visualised by setting up a 12 by 7 grid on a piece of graph paper. The x-axis defines the width of the character and is labelled from 1 to 12. On the y-axis the scale represents the printer pin numbers in powers of 2 and ranges from 2^1 through 2^7. This is shown in the diagram 'Sample firing pin pattern'.

When defining your own character set, remember that the same pin cannot be used on two adjacent columns. This would cause jamming of the pins and possibly damage the printhead. The Basic program listing (Fig 6) shows several examples for down loading custom characters using simple LPRINT commands.

R McCormick

After running this program, any of the six new characters that have been defined may be printed by using the appropriate CHR$() values. Additional custom letters and symbols may be defined using the techniques that are described by Mr McCormick — but there is another method to consider.

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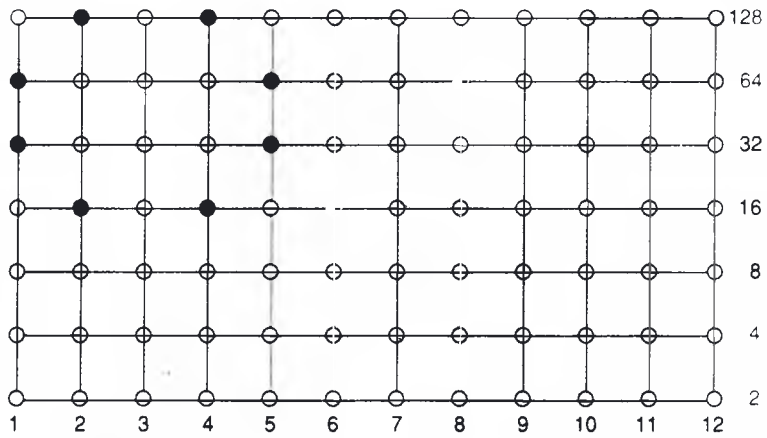
Sample pin firing pattern



The pin firing pattern for the CHR$(248) degree symbol.

send graphics images directly, which can be done on the fly each time the special symbol is needed. For example, type in the following command string on one line:

```
LPRINT CHR$(27) ''L'' CHR$(0)
'' ' ' '' STRING$(4,144) '' '
' ''
```

It will print the CHR$(248) degree symbol, but without adding it to the current set of resident characters.

The CHR$(27) 'L' sequence initialises double-density graphics, and the CHR$(8) CHR$(0) pair tells the Epson printer that 8 bytes of graphic data are to follow. (Two bytes are sent to accommodate long graphics strings — hence the use of the first number plus 256 times the second number.) The remaining bytes are the graphics data, which in binary represent the degree symbol. The data follows an organisation similar to that used for the downloadable characters.

Note that since the printer is in graphics mode, it will print only as many bits as you tell it to. Therefore, you may need to specify a few extra CHR$(0) bytes to maintain the correct spacing between characters.

With patience (and a thorough reading of your printer's owner's manual), these techniques could be applied to any printer that is capable of loading custom fonts or accepting graphics commands — EW.

Merging C and ASM listings

Sometimes the only way to trace a difficult bug in a C program is to study the machine language instructions generated by the compiler. While Turbo C can generate an assembler listing from a C source file, it can't put the two together in one file.

To solve this problem, I wrote a C program, MERGE.C (shown in Fig 7), that creates a single 'merged' listing of the original C source code and the compiler's assembler output. The result includes the C code as comments embedded in the assembler source.

To use MERGE, create an assembler listing from your C source code file by using the standalone Turbo C compiler with the -S option. Using the program HELLO.C (see Fig 8) as an example, the command line would be

```
TCC -S HELLO.C
```

This generates the assembler source file, HELLO.ASM. Next, create a merged C and assembler listing, HELLO.MER, as shown in Fig 9, by executing MERGE.

```
MERGE hello
```

D Johnson

```
10 '     The following program utilizes the DOWNLOAD CHARACTER
20 '     DEFINITION function of the Epson FX-80 printer and
30 '     adds a new character to the print set.
40 '
50 '
60       Reset & copy standard ROM CG into Download CG:
70 '
80 LPRINT CHR$(27); "@"; CHR$(0); CHR$(0);
90 LPRINT CHR$(27); ":"; CHR$(0); CHR$(0); CHR$(0);
100 '

110 '    Download info according to page 3-38, 39 of manual·
120 '
130 '    Character #248 = Degree sign
140 '
150 LPRINT CHR$(27); "&", CHR$(0), CHR$(248); CHR$(248),
160 LPRINT CHR$(139);
170 LPRINT CHR$(0); CHR$(96); CHR$(144); CHR$(0); CHR$(144), CHR$(96),
180 LPRINT CHR$(0); CHR$(0); CHR$(0); CHR$(0); CHR$(0); CHR$(0),
190
200 '    Character #241 = plus/minus
210 '

220 LPRINT CHR$(27), "&", CHR$(0), CHR$(241); CHR$(241);
230 LPRINT CHR$(139);
240 LPRINT CHR$(0); CHR$(0); CHR$(34); CHR$(0); CHR$(34); CHR$(0);
250 LPRINT CHR$(250); CHR$(0); CHR$(34); CHR$(0); CHR$(34); CHR$(0),
260 '
270 '    Character #234 = Lower case sigma (partial derivative)
280 '

310 LPRINT CHR$(27); "&", CHR$(0), CHR$(234); CHR$(234);
320 LPRINT CHR$(139),
330 LPRINT CHR$(0); CHR$(0); CHR$(4); CHR$(74), CHR$(144); CHR$(
340 LPRINT CHR$(144), CHR$(66), CHR$(60); CHR$(0), CHR$(0), CHR$(0)
350
360 '    Character #233 = Theta
370 '
400 LPRINT CHR$(27), "&", CHR$(0), CHR$(233); CHR$(233);
410 LPRINT CHR$(139);
420 LPRINT CHR$(0); CHR$(0); CHR$(16); CHR$(40), CHR$(84); CHR$(130),
430 LPRINT CHR$(16); CHR$(130); CHR$(84); CHR$(40); CHR$(16), CHR$(0),
440 '
450      Character #251 = Delta

460
490 LPRINT CHR$(27), "&"; CHR$(0); CHR$(251), CHR$(251),
500 LPRINT CHR$(139),
510 LPRINT  CHR$(4); CHR$(8); CHR$(20), CHR$(32); CHR$(68),
520 LPRINT CHR$(128); CHR$(68); CHR$(32); CHR$(20), CHR$(8), CHR$(4),CHR$(0)
530
540      Character #228 = Upper case Sigma
550
580 LPRINT CHR$(27), "&"; CHR$(0); CHR$(228), CHR$(228),
590 LPRINT CHR$(139),
600 LPRINT  CHR$(130); CHR$(68); CHR$(130); CHR$(40), CHR$(146);CHR$(0);
610 LPRINT  CHR$(130); CHR$(0), CHR$(198); CHR$(0), CHR$(0);CHR$(0);
690
700 LPRINT CHR$(0), CHR$(0);
710 LPRINT CHR$(27), "%"; CHR$(1); CHR$(0);
720 END
```

Fig 6 These routines show how to define and download custom characters to an Epson or IBM graphics printer

```
/* merge.c
 * DESCRIPTION: merges a 'c' source file with an asm file
 */

#include <stdio.h>

#define LINEBUFFER 200                  /* length of input line */
#define NAMESIZE 80                     /* DOS file/path length */

FILE *p_to_c, *p_to_asm, *p_to_mer;     /* declare file pointers */
char line_buffer[LINEBUFFER];           /* line buffer */
                                        /* file name buffers */
char file_c[NAMESIZE], file_asm[NAMESIZE], file_mer[NAMESIZE];

main(argc,argv)
int argc;
char *argv[];
{
   int line_count, run_count = 0;

   if (argc != 2)
       help_me();                   /* print the usage message */

   strcpy(file_c,argv[1]);          /* setup the .C filename */
   strcat(file_c,".c");

   if(!(p_to_c = fopen(file_c,"r")))        /* open the .C file */
       file_error(file_c);

   strcpy(file_asm,argv[1]);            /* setup the .ASM filename */
   strcat(file_asm,".asm");

   if(!(p_to_asm = fopen(file_asm,"r")))    /* open the .ASM file */
       file_error(file_asm);

   strcpy(file_mer,argv[1]);            /* setup the .MER filename */
   strcat(file_mer,".mer");

   if(!(p_to_mer = fopen(file_mer,"w")))    /* open the .MER file */
       file_error(file_mer);

                        /* read each line of the .ASM file */
   while (fgets(line_buffer,LINEBUFFER,p_to_asm) )
   {
       if(strncmp(line_buffer,"; Line",6))/* if "; Line" not found */
       {
           fputs(line_buffer,p_to_mer);     /* write it to merge file */
           continue;                    /* get next line */
       }
                            /* "; Line" was found */
       line_count = atoi( &line_buffer[7] );    /* generate a line count */

       if(run_count < line_count)       /* if backlog in .C file */
           for( ; run_count < line_count; run_count++)
               write_merge_line();      /* write the lines and catch up */
       else
       {
           write_merge_line();          /* write corresponding C line */
           run_count++;
       }
   }
   fclose(p_to_c);                  /* close all files */
   fclose(p_to_asm);
   fclose(p_to_mer);

}

/* write_merge_line()
 *  reads a line from the C source, and writes it out preceded by
 *  a ';'
 */
write_merge_line()
{
   fgets(line_buffer,LINEBUFFER,p_to_c);    /* get .C file line */
   fputs("; ",p_to_mer);                    /* write ';' to merge file */
   fputs(line_buffer,p_to_mer);             /* put .C line after it */
}

/* help_me
 * DESCRIPTION: prints out the title and usage
 */

help_me()
{
   printf("MERGE: a program to merge a 'c' source file and an ASM file\n");
   printf("USAGE: merge filename \n");
   printf("where filename is the name of the files to merge\n");
   printf("Do not type in the period or extension.\n");
   exit(0);
}

/* file_error
 * DESCRIPTION: prints out error message and name of the
 *              file that could not be opened
 */

file_error(name)
char *name;
{
   printf("MERGE: ERROR IN OPENING FILE: %s \n",name);
   exit(0);
}
```

Fig 7 MERGE.C is a handy little utility that allows C code to be mingled with the compiler's assembly output

Now here's a productive use of C! Not only can MERGE aid debugging efforts, but a 'merged' listing can be very useful for learning how C is translated into machine language by the compiler.

The limitations of MERGE require that only one .C file at a time be used to generate a merged listing. Since #include references are, of course, only used by the compiler, they will not be listed. Also, since Turbo C will rearrange code for maximum speed or size, the generated assembler may not be in logical order if optimisation switches are used.

I took the liberty of modifying MERGE.C slightly to include the globalisation of the line buffer, filename buffers, and file pointers (to get them off the stack); the creation of the write_merge_line() function instead of inline code; and a slight streamlining of the program logic. Microsoft C users can produce a similar merged listing by compiling with the /Fa and /Fs options — RS.

```
#include <stdio.h>
main()
{
        printf("Hello, world\n");
}
```

Fig 8 The simple 'Hello, World' program used to produce a merged listing

Patching REMOVE.COM

I use a lot of utilities from APC. Of these, INSTALL and REMOVE (see APC August 1987 — Ed) are my favourites for managing TSRs. REMOVE, however, requires that you hit the Enter key to peel off a layer of TSRs. That's great when you're at the DOS prompt, but when you have a menu system, there's no need.

Is there a way to patch REMOVE to avoid the prompt? This would allow readers to load and unload groups of TSRs automatically.

D Murgo

I agree, INSTALL, REMOVE, and PCMAP are three utilities I use every day to help manage my TSRs. But REMOVE isn't very friendly with batch files and insists on getting its keyboard input live. To help with this problem, I've devised two patches for the program.

Remember, before you try your hand at patching any program, always make a backup copy in case something goes wrong. You'll also need to have a copy of DEBUG either in the current directory or in a directory in your PATH statement.

The first patch involves replacing the BIOS get-a-key function with the DOS get-a-key function. This allows you to use the DOS redirection facility to feed characters from a file to REMOVE as if they came from the keyboard. First, enter the following commands to patch REMOVE.

```
DEBUG REMOVE.COM
E 204 B4 08 CD 21
W
Q
```

REMOVE will work just like it always has. Run it at the DOS prompt, and it will still ask you to press a key. But if you create a file that contains just the carriage return character and use redirection, REMOVE will execute without any keyboard input.

To create a response file that contains just a carriage return, enter the following commands:

```
COPY CON REMOVE.CR
^Z
```

The first line creates a file called REMOVE.CR and prepares to copy anything you type at the keyboard into it. The second line is blank — just hit the Enter key. The ^Z (Ctrl-Z) on the third line closes the file and is generated by holding the Ctrl key and pressing Z or hitting the F6 key. To run REMOVE automatically in a batch file, use the line

```
                name    hello
_text   segment byte public 'code'
DGROUP  group   _data,_bss
                assume  cs:_text,ds:dgroup,ss:dgroup
_text   ends
_data   segment word public 'data'
_d@             label   byte
_data   ends
_bss            segment word public 'bss'
_b@             label   byte
_bss            ends
_text   segment byte public 'code'
;       /*      HELLO.C -- Hello, world */

        #include <stdio.h>

        main()
        {
_main   proc    near
        printf("Hello, world\n");
        mov     ax,offset _s@
        push    ax
        call    near ptr _printf
        pop     cx

        }
        ret
_main   endp
_text   ends
_data   segment word public 'data'
_s@             label   byte
        db      72
        db      101
        db      108
        db      108
        db      111
        db      44
        db      32
        db      119
        db      111
        db      114
        db      108
        db      100
        db      10
        db      0
_data   ends
_text   segment byte public 'code'
        extrn   _printf:near
        public  _main
_text   ends
        end
```

Fig 9 This merged listing shows the original C code (highlighted) and helps demonstrate what goes on when the HELLO.C program to the left is merged with the compiler's machine language output. Listings of this type can help show what goes on inside a C program

```
REMOVE >REMOVE.CR
```

If you're sure you'll never need to confirm a REMOVE, or you want to create a special batch version (you can rename the file), the following patch will remove all requirements for a response. Start with a fresh copy of REMOVE and type the following commands:

```
DEBUG REMOVE.COM
E 1FC EB 13
W
Q
```

For a batch operation, the list of installed TSRs and confirmation prompts that REMOVE produces can be eliminated by redirecting standard output to the NUL device. To do this, use the command

```
REMOVE @ NUL
```

Atari ST Logo Tree Generator

This small tree-drawing program was designed to run on the Atari ST (Fig 10) but, with the references to line width removed, should run on any other machine which supports Logo, such as the Amstrad APC range or the Apple Macintosh. Not only does it draw very pretty trees, but also shows one of Logo's most powerful features — recursion.

```
TO TREE :LEN :ANG :NUM :WID :DECW ;setting up routine
FS                                ;graphics window to max size
CS                                ;clear graphics window
PU                                ;pen up
SETY -160                         ;set turtle to bottom middle of screen
PD                                ;pen down
HT                                ;hide turtle
BRANCH :LEN :ANG :NUM :WID :DECW  ;call main routine
END                               ;end program

TO ODEV :NUM :ANG                 ;subroutine to turn left initial amount
IF (REMAINDER :NUM 2 = 0)         ;even or odd number of branches ?
    [LT ((:ANG / 2) + (:NUM / 2 - 1) * :ANG)]
                                  ;even, so turn this amount
    [LT (((:NUM - 1) / 2) * :ANG)]
                                  ;odd, so turn this amount
END                               ;exit subroutine

TO BRANCH :L :A :N :W :DW         ;main routine
(LOCAL "PRES_POS "PRES_HEAD)      ;local variables to store position and heading
IF (:L =< 5) [STOP]               ;if length too small, end this recursion
MAKE "PRES_POS POS                ;store turtle position
MAKE "PRES_HEAD HEADING           ;and heading
SETLINE (LIST 1 :W 1)             ;set line width
RT ((RANDOM :A) - (:A * 0.5))     ;turn a random amount between -.5:A and +.5:A
FD :L * ((RANDOM 6) + 7) / 10     ;forward, again with slight, random variation
MAKE "L INT (:L * 0.7)            ;shortens length for next 'branch'
ODEV :N :A                        ;call subroutine to turn right initial amount
REPEAT :N [BRANCH :L :A :N (:W * :DW) :DW RT :A]
                                  ;repeat all this 'N' times
PU                                ;pen up
SETPOS :PRES_POS SETH :PRES_HEAD  ;reset turtle position and heading
PD                                ;pen down
END                               ;exit this recursion
```

Fig 10 An Atari Logo tree generator

The program is split into three routines. The first, called TREE, calls the program, sets up the graphics screen and moves the turtle to its starting position. This then calls the main routine, BRANCH, where all the work in generating the tree is done. And, finally, a small routine, ODEV, which determines the amount of left turn needed to start the program. A typical tree using the command TREE 100 40 2 10 .7 is shown below. The parameters for the tree are determined by the five input variables:

:LEN — Initial length of the trunk.

:ANG — Angle between the branches.

:NUM — Number of new branches at the end of each old one.

:WID — Initial width of trunk.

:DECW — Width reduction factor to improve tree-like image.

J Sloman

END

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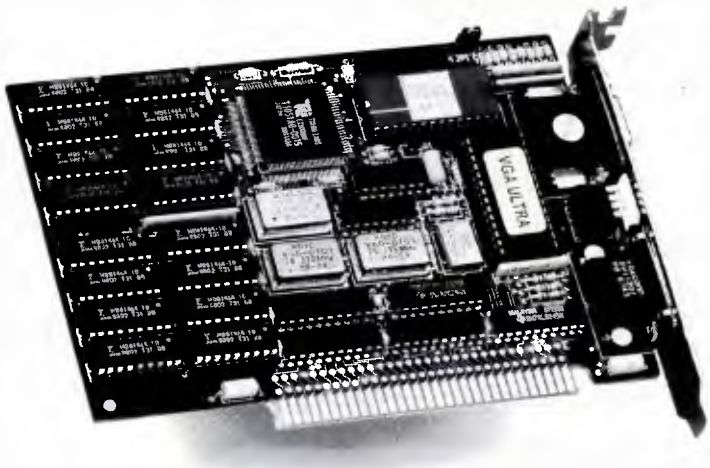

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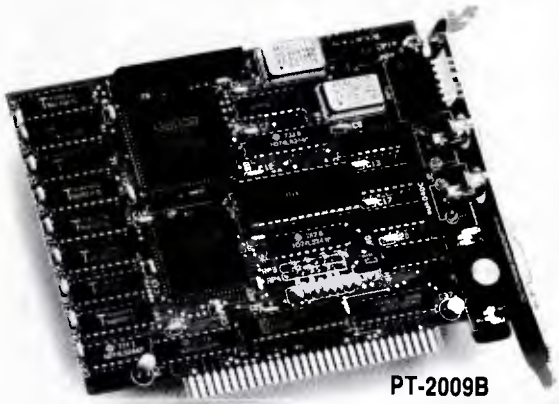

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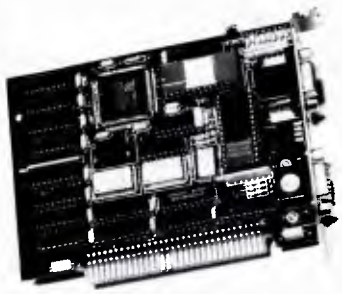
—Simultaneous display of up to 8 fonts
—65 MHz maximum dot clock speed



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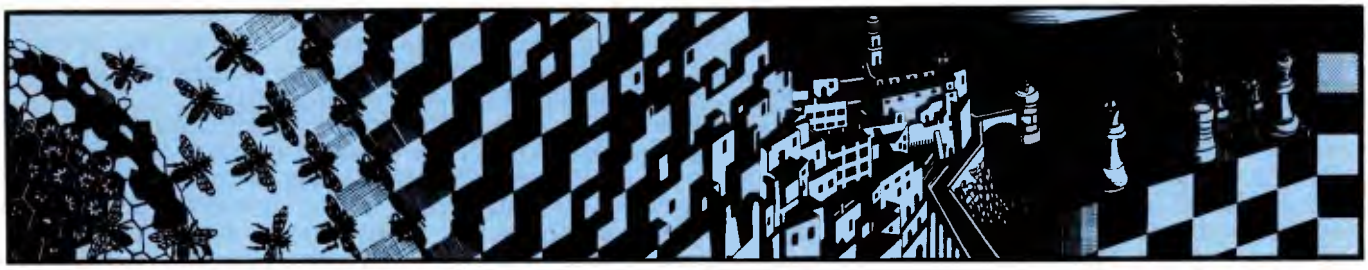


Chris Cain goes back to the mythical age of demons, dragons and dark castles, while Neil Rubenking discovers immortal legends with familiar characters from English literature.

Reconcilliation of the spirits

Title: Dungeon Master
Computer: Atari ST
Supplier: ISD
Format: Disk
Price: $69.99

Fantasy adventure games have long been the favourite pastime of many computer users. One that springs to mind is The Bard's Tale, published by Electronic Arts, which became a standard for fantasy adventurers and is enjoyed by a great many people. Now it faces extremely stiff competition in the form of Dungeon Master.

Dungeon Master is a fantasy set in the mythical age of dragons, demons and dark castles; days when men lived by the sword and the only youth training scheme was that of an apprentice wizard. The good old days.

The game is the story of Theron and his quest to free the Mage Grey Lord from his imprisonment in limbo. Split into two halves by a miscalculated spell, Grey Lord's good spirit is trapped while his dark side now lives in the damp, dark depths of his castle's dungeon. Using his last ounce of Mana — the magical energy which surrounds every living thing — he revealed himself to Theron, his apprentice, in the hope that he can reverse the process and destroy the evil ruling the castle.

Utilising only the power of his mind Theron must recover the Fire-staff, a symbol of power, which was flung into the dungeon along with Chaos, Grey Lord's alter-ego. And so the game begins with Theron's view of the dungeon entrance.

Using the mouse, you must help Theron with his mission. As he cannot enter the dungeon himself, you must choose the adventurers who are to follow his guidance. Here, after a very long loading session, the screen splits into two displays — the current view and the movement icons. Dungeon Master locations are shown in 3D, as if you were walking through a maze, and allow for fast movement around the dungeon.

Using the arrow icons to move around, your task is to locate the Hall of Champions. This is Chaos' trophy room where the souls of unlucky adventurers are imprisoned. From the 24 warriors available, only four can be brought back from the dead. Each character is displayed as a portrait and by clicking on them you can see what kind of beings are on offer.

Most have a typical fantasy name such as Syra, Child of Nature or Halk the Barbarian. One, however, which confused me was a young female Ninja called Wu Tse, 'Son' of Heaven. I know this is fantasy, but even so ...

When your mind is made up, you may resurrect or reincarnate a soul. Although these perform the same function, reincarnation allows the player to rename the character. When four adventurers have been restored, you must gather all the equipment at hand before setting off further into the dungeon. (This is harder than it sounds, as finding your way out of the hall appears to be half the game!)

Having selected a suitable leader for your party, the mouse pointer becomes their hand and any objects found lying around may be picked up, thrown, eaten or pocketed for later use at the player's will. A character may carry up to 22 objects which are distributed between a backpack, a quiver and a pouch.

Complete icon control is one of the game's unique strong points, making acquaintance with the game easier. The leader's hand is used to do everything, and so opening doors is just a matter of picking up the correct key and selecting the lock on the door. Good, eh?

Another simple but effective touch is the way the doors and portcullises, used

to access different levels of the dungeon, can be opened by a switch in another location, complete with grinding sound effects. If you move fast enough, the door will be opening as you approach it. Torches give nice lighting effects and, as the flames start to die, the dungeon walls become a shade darker until the light finally fades and you are left in the dark.

As well as using conventional items such as swords and torches, magic spells may be cast by any member of the group, provided they have enough Mana. The current Mana level is displayed along with health and stamina at the side of the portraits which are shown at the top of the screen. Casting a spell is no easy task, and only by studying the accompanying novella can the magical symbols be understood. This makes for better copy-protection, as well as adding a great deal of atmosphere.

Although spells are useful it isn't wise to use up all your Mana at once, so think about them carefully. One mistake in the creation of even the simplest potion will result in the loss of at least half of the character's present Mana level.

Unfortunately, your guys aren't the only visitors wandering around. There is a positive horde of nasties lurking about and, should you meet one, be prepared to fight. Combat is fairly simple in Dungeon Master, and is shown in an arcade-style format rather than the usual 'attack round'.

When fighting, weapons can be used only if they are placed in the 'action' hand of the appropriate warrior. The attack command is then issued by clicking on the corresponding icon for that character.

Digitised sword swishes have been used to provide more realism, but it seems strange that all the people in the game are left-handed! Should one of the brave souls die, their bones will hit the floor along with any items they were carrying. While it isn't possible to select another soul from the Hall of Champions, you can reincarnate the victim if you can figure out how.

Dungeon Master is graphically excellent, with all the icons and objects displayed in staggering detail. Apart from a bug-ridden, icon-handling routine which makes the leader's hand flicker and constantly changes the colour of the objects in use, the only criticism I have is that all the walls are a dull grey. Still, in a dungeon I suppose that's to be expected. Sound comes in the form of a few sampled effects, but nothing special. A soundtrack would have been nice.

With its simple control, instant addictiveness and an immense world to explore, Dungeon Master will probably remain at the top of the charts for weeks and weeks. Let's hope the game is soon converted to other machine formats, such as the PC and the Amiga, as this will no doubt encourage more people to take the plunge into the realm of fighting fantasy.

High-tech sleuthing with infocom's sherlock

Title: Sherlock: The Riddle of the Crown Jewels
Computer: Macintosh
Supplier: Imagineering
Format: Disk
Price: $95.00

Infocom's *Sherlock: The Riddle of the Crown Jewels* pits you against Sherlock Holmes's nemesis, Professor Moriarty. Her Majesty's Golden Jubilee is only two days away, and Moriarty has stolen the Crown Jewels. The Queen must wear the jewels for the Jubilee; their loss is a disaster. Moriarty has left plenty of clues, clearly intending to lead Holmes into a trap. In order to derail the Professor's plans, the Great Detective introduces a random factor by putting you, Dr Watson, in charge of the investigation.

Solving Professor Moriarty's poetic clues requires some knowledge of English history. For example:

For two-score years I reigned alone.
A virgin queen on England's throne.
My navy caused Armada's shame,
And with me died the Tudor name.

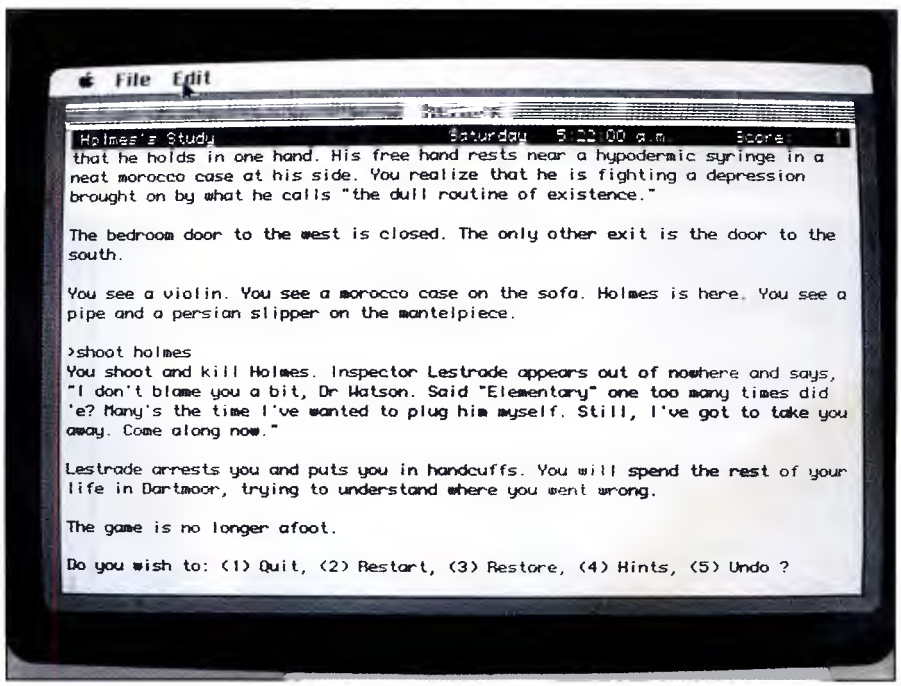
You'll find other clues in the package. Infocom supplies a map of London and the previous day's *"London Thames."* Do look beyond the obvious places for clues — at least one important clue is found only in the Instruction Manual. You must find and solve the clues in order to figure out what to do next.

Sherlock features Infocom's new online hints. These are an electronic version of the "Invisiclues" hint booklets available for older games. With them, you can solve Moriarty's verses even if your historical knowledge is limited to King Arthur and Princess Di. Of course, the list of questions is a clue in itself, so the game advises against using hints. In fact, you can turn HINTS OFF to avoid temptation.

Every time you enter a command, time passes. You have just 48 hours to find the stolen jewels and save England's pride. If you run out of time, simply start over. With the knowledge you've gained, the next time will go faster. When you know exactly what you're doing, you can solve almost all the clues in less than 12 game hours. Certain events happen at fixed times, so the final minutes will always be a frantic rush.

Sherlock is the first of what Infocom calls its "Immortal Legends" series, based on familiar characters from English literature. It's an auspicious first offering, and one that Friends of the Great Detective and adventure gamers alike will enjoy.

END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Holmes's Study Saturday 5:22:00 a.m. Score:
that he holds in one hand. His free hand rests near a hypodermic syringe in a neat morocco case at his side. You realize that he is fighting a depression brought on by what he calls "the dull routine of existence."
The bedroom door to the west is closed. The only other exit is the door to the south.
You see a violin. You see a morocco case on the sofa. Holmes is here. You see a pipe and a persian slipper on the mantelpiece.
>shoot holmes
You shoot and kill Holmes. Inspector Lestrade appears out of nowhere and says, "I don't blame you a bit, Dr Watson. Said "Elementary" one too many times did 'e? Many's the time I've wanted to plug him myself. Still, I've got to take you away. Come along now."
Lestrade arrests you and puts you in handcuffs. You will spend the rest of your life in Dartmoor, trying to understand where you went wrong.
The game is no longer afoot.
Do you wish to: (1) Quit, (2) Restart, (3) Restore, (4) Hints, (5) Undo ?

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# 5 year warranty	NO	YES
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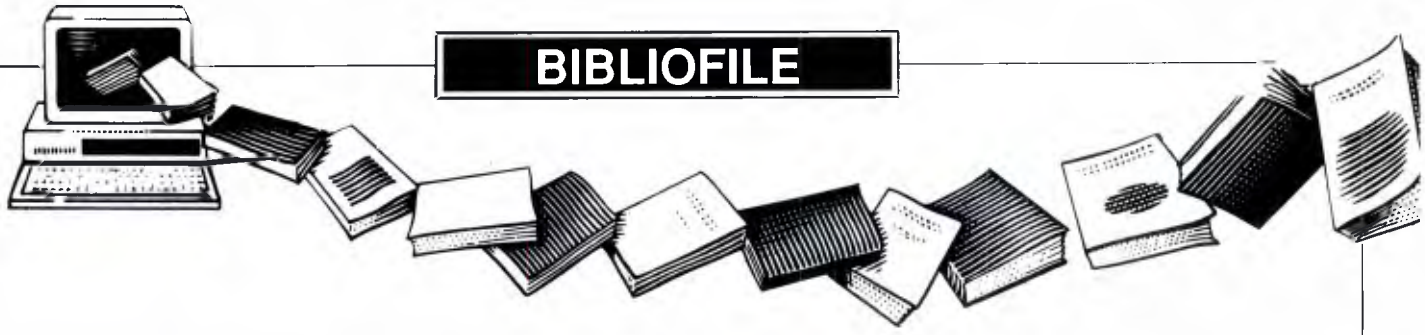
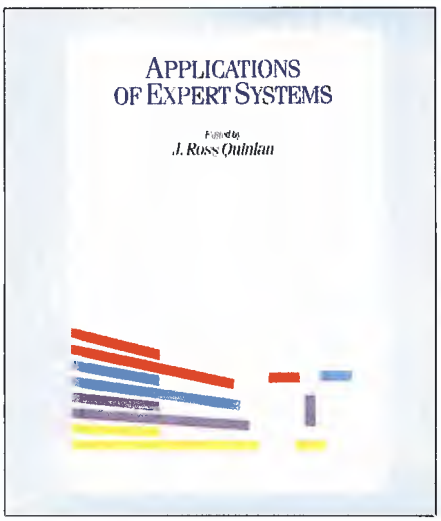


BIBLIOFILE

Our panel of reviewers guides you through the latest crop of books on expert systems, plus some general reading too.



Applications of Expert Systems

Editor: J Ross Quinlan
Publisher: Addison-Wesley
ISBN: 0-201-174-49-9
Price: $34.95

This book is a collection of papers which were presented at a conference on Expert Systems held in Australia in May 1986. These papers are by some of the world's leading experts in the development of expert system technology.

The collection is edited by J Ross Quinlan of the New South Wales Institute of Technology and inventor of the ID3 algorithm, which is still the best technique for knowledge induction yet devised.

This is definitely a book for readers with both an understanding of expert systems techniques and a good grounding in computer science. It is primarily an academic book, although most of the papers do deal with specific applications and there is a very good introduction to the current state of expert system development by Patrick H Winston who is well-known as one of the founding fathers of artificial intelligence and the AI language LISP.

In its 219 pages there are a total of 12 different papers covering subjects as diverse as the use of expert systems in legal decision-making and knowledge acquisition for radar classification. Each section is laid out in classic academic style with an initial synopsis and a comprehensive set of references to published source material. However, since each section has a different author, or even authors, there is a wide range of writing styles, some of which are very easy reading and some. rather heavy-going.

Although this is basically an academic book, if you already know about, and perhaps work with. expert systems, then you will certainly find many items of interest. However, it is *not* a book for the layman.

Nick Hampshire

Managing Expert Systems

Author: Nigel Bryant
Publisher: Jacaranda Wiley
ISBN: 0-471-91341-3
Price: $43.05

In the last six months there have been few magazines or newspapers with any pretension to the appellation 'serious' which have not had at least one article about 'expert systems'. Unfortunately, this is a term which all too easily rolls off the tongue of the man in the street or the pen of the journalist. As a result it is a subject about which many have heard, but which precious few people understand.

In this slim volume, the author, a lecturer at the Cranfield School of Management, quite successfully gives the layman a good grounding on what an expert system is and, even more importantly, what it can do.

This is a very readable and practical book which is primarily aimed at managers and business studies students rather than computer professionals. It is, therefore, written with the assumption that the reader has a minimal knowledge of computing.

The author leads the reader through a short introduction to the subject of artificial intelligence and straight into the very heart of an expert system 'the knowledge base' and rule structures. With plenty of practical examples he shows how a set of rules can be used by an automated inference system to generate a knowledgeable answer to a problem.

The book goes through each step in the development of an expert system, the choice of application, the choice of expert system shell, and the construction of a knowledge base.

This book also gives the reader guidelines for developing their own system. This book is not machine specific; however, the majority of commercial expert systems listed at the end are for the IBM PC.

What I particularly liked about *Managing Expert Systems* was the clarity of its presentation and the fact that the author has managed to cover adequately all aspects of the subject without indulging in any obscure technical diversions.

Managing Expert Systems forms an ideal introduction to expert systems, and it should be on the recommended reading list of everyone who wishes to know more about this fascinating new area of computer technology.

Nick Hampshire

Expert Systems — Artificial Intelligence in Business

Authors: Paul Harmon & David King
Publisher: Jacaranda Wiley
ISBN: 0-471-80824-5
Price: $41.70

This title is written by two American management consultants who are specialists in the area of applying artificial intelligence techniques to business. The book is a comprehensive introduction to expert systems, and is aimed at readers who already have a grounding in the use of computers and wish to know if the technology can be applied to their specific problems.

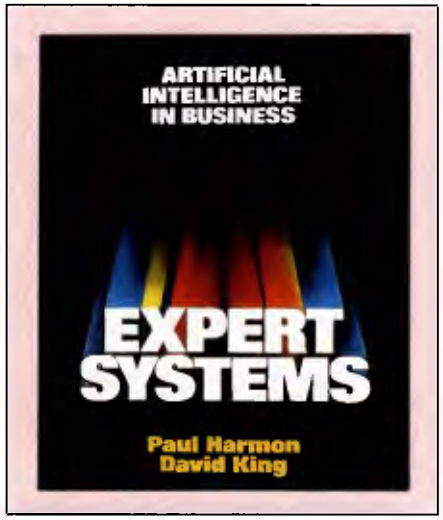
The first part is an introduction to the concepts and techniques of expert systems and their implementation. All the different ways in which expert systems can use and represent knowledge are examined.

The text is accompanied by many excellent diagrams and examples drawn

from some of the classic expert system developments, such as MYCIN.

In the second section the authors look at all the expert system languages, tools and systems which are currently on the market. However, it should be noted that since the authors are American, most of the programs referred to are also of US origin.

Similarly, the authors also concentrate on systems which run on special AI



workstations, such as the Sun and the Apollo, which together with a preference for LISP is in contrast to Australia where most expert systems are developed with the IBM PC in mind.

The third section is devoted to an excellent practical examination of how an expert system can be developed. The authors look at the selection of an application, the elicitation of knowledge and the construction of a knowledge base.

The last section examines the expert system market, and where it is likely to go in the next five years. This section, like the rest of this excellent book, is well-illustrated and contains frequent examples from existing applications, as well as plenty of statistics.

Also included is a good glossary, a list of references and company contact addresses.

Throughout this book the authors take the reader step by step through the process of developing a practical small expert system. With this book, and one of the commercial expert system shells, the reader should be able to build their own system.

If you are into computing and want to know more about expert systems or building your own system, then this book is a good read and comes highly recommended.

Nick Hampshire

Building your first Expert System

Authors: Tom Nagy, Dick Gault and Monica Nagy
Publisher: McGraw Hill
ISBN: 0-912677-53-8
Price: $75.00

In *Building your first Expert System*, the authors aim to guide the reader into building a modest, quality expert system quickly, as well as teaching the key principles of expert systems along the way. They are well-qualified to do this as Tom Nagy is an Associate Professor of Expert Systems at George Washington University, Dick Gault is an Instructor of Expert Systems and Artificial Intelligence at the Defense Intelligence College, and Monica Nagy is a freelance Lisp and Kes programmer.

Using the MICRO-PS software disk provided with the book, you are taught how to build a small scale prototype expert system step-by-step, through Demo 1, Demo 2, Proto1 and Proto2 — Proto2 being the exact equivalent of the PC File Operation's Expert System 'the powerful and useful expert system that solves a real problem: giving good, cheap and always available consultation on file operations in PC-DOS'.

The book is divided into four sections: Part I: About Expert Systems; Part II: Building an Expert System; Part III: The MICRO-PC Manual; and Part IV: Glossary and Appendices, but I must admit I found the format boring.

For me, there wasn't enough variety of presentation or content to keep my attention. I found the figures — that is, diagrams — difficult to differentiate from the text, and the half boxing off effect made it even worse, resulting in the page looking very messy. All the explanations of Attachments, Attributes, Rules and Actions are there, but if I were a first-time user of expert systems looking for a book to help me, then I think I could find better value for money elsewhere.

Lorna Kyle

Building your own Expert System

Author: Chris Naylor
Publisher: Jacaranda Wiley
ISBN: 1-85058-071-5
Price: $43.05

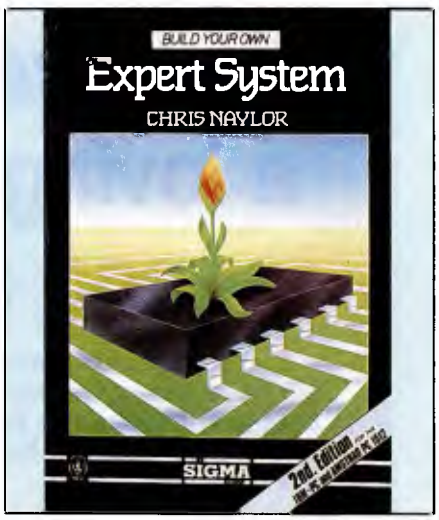
I love a sense of humour, and therefore any author who begins a books on 'Expert Systems' with the sentence 'Once upon a time a long time ago when the Earth was still new and the Sun had a big smile on its face when it got up each morning' has me hooked from that point on. I have a mental image of Chris Naylor, the author of *Build Your Own Expert System* as a conscientious academic but also someone who enjoys a good laugh and drinks a lot of beer — his references to drink, bars, hostelries are numerous. His recommendation for buying his book is, at the least, honest: 'the real reason you should buy this book is because, for a book on computers, it is relatively cheap.'

This honesty and humour are prevalent throughout the book, but nowhere more so than in Chapter One. Here he opens the mysteries of expert systems as if he were a surgeon in a theatre and exposes all the rubbish and fogginess that surround the term 'Expert System'. He chats at length about the clouds of confusion that have arisen around these systems because people:

- don't know for what they're used;
- haven't got one themselves; or
- haven't the faintest idea how to go about getting/building one.

The heart of this chapter explains that an expert system is, after all, only a computer program.

Naylor then moves on into the world of probability and statistics, Bayes theorem and Chi-squared, parallel and sequented



decisions, building rules and creating modes. His programs are written in Basic and also have been tested in Advanced Basic (BasicA), GWBasic and Locomotive Basic 2. Helpful examples are provided and, in Chapter 12, all the technical terms and definitions used are summarised.

I enjoyed this book very much; it's not recommended for the serious and straitlaced user, but if you'd like a text book that mixes reality, humour and knowledge in the world of expert systems, then I'd recommend this one.

Lorna Kyle

BIBLIOFILE

Expert Systems for Business

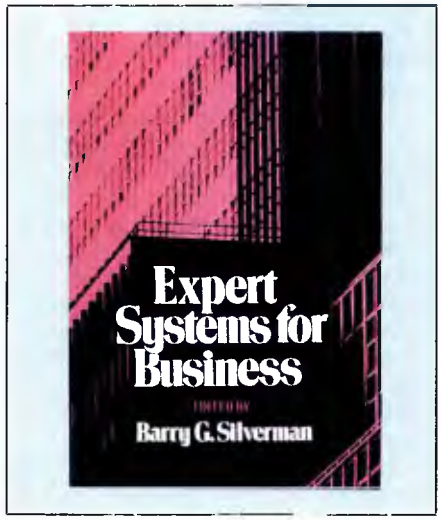
Editor: Barry G Silverman
Publisher: Addison-Wesley
ISBN: 0-201-07179-7
Price: $34.95

The field of 'Expert Systems' differs in many ways from conventional 'Business Computing' practices: this book is intended for business managers and others interested in finding a realistic use for expert systems in business and management, and it starts with a good layperson's introduction to the necessary basic concepts in expert systems.

The majority of the book uses existing systems and current research to illustrate both the possible application areas and the technical issues involved. Case studies of the use of expert systems technology are presented, covering a very wide variety of applications in business.

In this respect, the book is similar to other works — tales of the successes and failures of specific applications. However, what makes this book *so* special is that it includes a discussion on integrating expert systems into the business environment.

Over a quarter of the book is devoted to this topic, covering a wide spectrum of issues which should be highly relevant



to the serious reader, and it concludes with a hype-free look at next-generation technology.

The standard of writing is high throughout the text: a total of 32 authors have contributed, and there is a fair balance between authors from academic institutions and those from commercial firms. The consequence of this is that the book has a realistic perspective on what is required and what is achievable, giving a broad introduction for the layperson, but including extensive lists of (academic) references at the end of each chapter.

The only notable omission is the lack of discussion of 'Expert System Shells' and 'Knowledge Engineering Environments', which is acknowledged by the authors; however, these topics are arguably of little concern to business readers.

The book's biggest flaw is that it suffers from a barely adequate index; its content should qualify it as both a text-book and a reference book, but the poor indexing will hinder its use for reference purposes.

For both breadth and depth of coverage, *Expert Systems for Business* is strongly recommended as a 'best buy' for the business-person with a serious interest.

It should also prove a useful browser for people with a general interest in AI: it can be enlightening to see the needs of the 'real world'.

Dave Cliff

END

"I've got two children, a loving husband, a good job and multiple sclerosis."

I've got multiple sclerosis, but it isn't the end of the world. Like most people with MS, my symptoms are mild. They come and go, but in between I'm fine.

I intend to go on as I am, with a supportive husband, two wonderful children and an understanding boss.

Some people with MS are more disabled than I am. They need the activity therapy centres, residential accommodation and the other services which the MS Society provides.

For their sakes, keep up your donations.

For most of us, though, remember that MS doesn't always mean wheelchairs. Your understanding helps us to keep our jobs, homes and families.

Support MS with your understanding as well as your dollars.

MS

For more information about multiple sclerosis contact the MS Society.

User groups

Below is a complete list of updates and additions to the full User Group listing which is available to readers on request. Please send a stamped, self-addressed envelope to 'User Groups', APC, 124 Castlereagh Street, Sydney 2000.

NSW

The APL User Group meets on the third Wednesday of each month at IP Sharp Associates, 8th Floor, 55 Elizabeth Street, Sydney. Activities include lectures, tutorials, and demonstrations.

For further information contact the Secretary, John Hamilton, GPO Box 1425, Sydney 2001. Tel: (02) 227 5981.

Apple User Group holds two meetings per month. The Macintosh General Meeting and Apple II Special Interest meetings are held on the first Monday of each month; and the Apple II General Meeting and Macintosh Special Interest meetings are held on the second Monday of each month. Meetings are held in the Stephen Roberts Theatre at the University of Sydney, commencing at 6.00pm. Activities include group discussions, special interest groups, bulk purchases, bulletin boards, and they also have a library of software, shareware and various sample/demonstration programs.

For further information, contact Graham Clark, PO Box 505, Bankstown 2200. Tel: (02) 958 2709.

The Australasian Microcomputer User Group meets on the third Monday of each month at the Crows Nest Club, Hayberry Street, Crows Nest, commencing at 7.00pm. Activities include training programs, helping smaller business people and newcomers to computers.

For further information contact John Rigby, PO Box C530, Clarence Street, Sydney 2000. Tel: (03) 913 2113.

The Bathurst Computer Group meets on the second and fourth Friday of each month (during school terms) at the West Bathurst Public School, Suttor Street, Bathurst.

For further information contact the President, Gary Douglas, PO Box 1104, Bathurst 2795. Tel: (063) 31 6702.

BBC User Group of Sydney — see Ozbeeb the Acorn.

The Blue Mountains Homebrew Computer Club meets irregularly in members homes or at workshops. Activities include the support of APPLIX (ETI 1616 project), Maestro Novix Forth computer kits, and the Atari ST range. They also publish a newsletter.

For further information contact Eric Lindsay, 6 Hillcrest Avenue, Faulconbridge 2776. Tel: (02) 218 9651 bh, or (047) 51 2258 ah.

The Combined Ashton-Tate User Group holds two separate meetings. The dBASE User Group meets on the third Tuesday of each month, and the Framework User Group meets on the second Wednesday of each month. Both are held at 185 Elizabeth Street, Mirvac Building, Sydney, commencing at 6.30pm. Activities include presentations, help with Framework and dBASE software, monthly bulletin and bulletin board on (02) 869 8779.

For further information contact Hans Schneider, GPO Box 3019, Sydney 2001. Tel: (02) 309 2961.

The Control and Monitoring User Group puts members in touch with others interested in using their PC for interacting with the real environment.

For further information contact Rob Whyte, PO Box 134, St Marys 2760. Tel: (02) 623 5967.

The East Coast Amiga Group holds three meetings. The Amiga group meets on the second Friday of each month at the Wyong Community Centre, Cnr Alison and Rankin Streets, Wyong; and the fourth Friday of each month at the Niagara Park Public School, Narara Valley Drive, Niagara Park.

The 64/128 group meets on the second Tuesday of each month at Niagara Park Public School. Activities include tutorials, software and hardware demonstrations, public domain software.

For further information contact the Secretary, PO Box 86, Umina 2257. Telephone Jeff Campbell (043) 41 8140 or Dick Bridge on (043) 23 2179.

The Macarthur Computer User Association meets on the first Monday of each month (except January). Activities include workshops, presentations, demonstrations and excursions. They also hold courses, hire equipment and bulk buy certain computer items.

For further information contact Ian Douglas, 10 Ulmarra Avenue, Camden 2570. Tel: (046) 66 6463.

Ozbeeb the Acorn and the BBC User Group of Sydney meet on the second Wednesday of each month at Barson Computers, North Ryde; and the fourth Monday of each month at Marist Boys High School, West Mead. Activities include demonstrations, talks, user's forum links with hardware/software houses.

For further information contact Alan Jones, PO Box 1030, Parramatta 2150. Tel: (02) 635 4868.

The Sorcerer User Group meets at the Greenwich Community Centre, 46 Greenwich Road, Greenwich. Activities include demonstrations, discussions, and weekend seminars. The group also has a library of public domain software, publish a newsletter, and maintain a bulletin board.

For further information con-

tact the President, S Mannasz, PO Box E162, St James 2000. Bulletin Board (02) 626 8020.

The Sydney Commodore User Group, Sydcom, meets on the second Friday of each month, and holds workshops on the third Friday of each month. Meetings and workshops and are held at the Ryde Catering College, 250 Blaxland Road, Ryde, commencing 7.30pm. The group caters for users of all Commodore computers and publishes a regular newsletter.

For further information contact the Secretary, Ian Langton, GPO Box 1542, Sydney 2001. Tel: (02) 810 3257.

The Sydney Kaypro User Group meets on the second Tuesday of each month at the Burwood RSL Club, Shaftesbury Avenue, Burwood, commencing 7.30pm. Activities include help with hardware and software, MS-DOS/CP/M. The group also maintains a software library and publish a regular newsletter.

For further information contact Hans Schneider, PO Box 63, Concord 2137. Tel: (02) 309 2961.

Sydney Macintosh User Group — see Apple User Group (Sydney).

The Sydney Microbee User Group meets on the third Saturday of each month at Strathfield Girls High School, Albert Road, Strathfield. Activities include demonstrations, sale of public domain software and exchange of information.

For further information contact the Secretary, Peter Wagner, PO Box C233, Clarence Street, Sydney 2000. Tel: (02) 86 4575.

The Western Sydney Macintosh User Group (WESTMUG) meets on the third Wednesday of each month at the Nepean College of Advanced Education in the Macintosh Computer Room, Kingswood, commencing at 6.30pm. Activities include workshops, assistance with software/hardware problems and demonstrations.

For further information, contact the Acting Secretary, Paul Talbert, PO Box 523, Penrith 2750. Tel: (047) 21 9407 bh or (047) 35 2115 ah.

VIC

The Amiga User Group meets on the third Sunday of each month at the Rotunda, Monash University, Wellington Road, Clayton, commencing at 2.00pm. Activities include demonstrations, special interest groups and Amigalink BBS. The group also maintains a public domain library and a book and magazine library.

For further information contact the Secretary, J Elston, PO Box 48, Boronia 3155. Tel: (03) 879 2322 BH.

The AZUAVIC User Group meets on the third Wednesday of each month at the Mount Waverley Community Centre, Cnr Stephensons Road and Miller Crescent, Mount Waverley, commencing at 7.00pm. Activities include information interchange, demonstrations, assistance with repairs, support for Sinclair computers, ZX81, Spectrum and QL. The group also publishes a monthly newsletter.

For further information contact Cliff Restarick or Paul Peeler, 208 Kooyong Road, Caulfield North 3161. Tel: (03) 528 2539 CR or (03) 596 3370 PP.

The dBASE User Group meets on the fourth Wednesday of each month at the World Trade Centre, 6th Floor (enter via Commerce Building). Activities include discussions and demonstrations.

For further information contact Vic Parsons. Tel: (03) 318 2666.

The Enable User Group of Victoria meets on the first Thursday of each month at the Paxus/Mera Offices, 6th Floor, Commerce Building, World Trade Centre, Melbourne, commencing at 6.00pm.

For further information, contact James Fricker, 546 Burwood Road, Hawthorn 3122. Tel: (03) 819 5452.

The Forth Interest Group meets on the first Friday on each month at the Bowen Street Neighbourhood Centre, 102 Bowen Street, Camberwell South, commencing at 8.00pm. Activities include discussions, support and question and answer sessions.

For further information, contact the coordinator, Lance Collins, PO Box 103, Camberwell 3124. Tel: (03) 29 2600.

The KAOS Computer User Group meets on the first Sunday of each month (except January), at the Sandown Scout Hall, Dowling Avenue, Springvale, commencing 1.00pm; and on the last Sunday of each month (except December), at the Senior Citizens Club, Munro Street, Ascot Vale, commencing at 1.00pm. Activities include assistance in running software and customising hardware; the group publishes a monthly newsletter.

For further information contact John Whitehead, 17 Frudal Crescent, Knoxfield 3180. Tel: (03) 763 5983 ah.

The MBUG Australia User Group meets on the second and fourth Wednesday of each month. Activities include information interchange and demonstrations.

For further information contact Andrew Barfoot, PO Box 157, Nunawading 3131. Tel: (03) 758 4822.

The Melbourne Atari Computer Enthusiasts meets on the second Sunday of each month (except January) in the Rotunda Building, Monash University, commencing at 10.30am. Activities include music/MIDI interest group, screen art, beginner's corner, and adventuring.

For further information write to PO Box 340, Rosanna 3084. BBS: (03) 899 6203.

The Melbourne Color Computer Club meets on the first and third Tuesday of each month at the corner of Dandenong Road and Chapel Street, St Kilda, commencing at 7.30pm. Activities include learning Base OS-9 and assembly language.

For further information contact the Secretary, Les Leishman, 282 St Georges Road, Northcote 3070. Tel: (03) 484 0822.

The Melbourne Commodore Computer Club meets on the third Wednesday of each month at the Nunawading Civic Centre, Whitehorse Road, Nunawading, commencing at 7.30pm. Activities include demonstrations, discussions, exchange of information and problems. The group also maintains a public domain library for VIC 20, C64/128.

For further information contact Chris Franks, PO Box 177, Box Hill 3128. Tel: (03) 758 5529.

The Melbourne PC User Group meets on the first Wednesday of each month (except January) at the Clunies Ross House, 191 Royal Parade, Parkville, commencing at 6.00pm. The group also holds an average of 14 meetings during each month, covering different areas.

For further information contact the Secretary, David Owen or the Administrative Officer, David Sloan, GPO Box 1728P, Melbourne 3001. Tel (03) 642 1234 DO or (03) 699 1943 DS.

The Microcomputer Club of Melbourne meets on the third Saturday of each month at the Burwood Campus of Victoria College, Building E, 221 Burwood Highway, Burwood, commencing at 1.00pm.

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For further information contact Donald Riley, PO Box 60, Canterbury 3126. Tel: (03) 544 5444 bh.

The Northwest Amiga User Group meets on the second Wednesday of each month at the Essendon Community Centre, Mt Alex Road, Moonee Ponds, commencing at 7.30pm. Activities include demonstrations, new products, question and answer sessions.

For further information contact the Treasurer, Simon Sheed, 4/25 Liverpool Street, Coburg 3058. Tel: (03) 383 4905.

The RBase User Group meets on the first Monday of each month at 502 Spencer Street, Melbourne, commencing at 5.30pm. Activities include discussions and sharing tips and traps.

For further information contact See Mee Heang or Malcolm White. Tel: (03) 329 0766, or Fax (03) 329 2433.

The Spectravideo and MSX User Group meets on the first Saturday of each month at the Nunawading Civic Center, G.J. Wills Room, Whitehorse Road, Nunawading, commencing at 1.00pm.

For further information, contact the President, Mitch Raitt, 68 Grassy Flat Road, Diamond Creek 3089. Tel: (03) 438 2687.

The Tandy MS-DOS User Group meets on the second Monday of each month at 2 Cole Street, Hawthorn East, commencing at 8.00pm. All users of MS-DOS, IBM compatible computers are welcome.

For further information contact the President, Tony Lloyd. Tel: (03) 882 4664 BH.

The Victorian Osborne User Group meets on the fourth Sunday of each month at the Ashburton Public Library, 152 High Street, Ashburton, commencing at 2.00pm. Activities include workshops, presentations, public domain software library.

For further information contact Geoff Cartwright, PO Box 169, Camberwell 3124. Tel: (03) 459 8934.

The Yarra Valley User Group meets on the first Tuesday of each month at the Melba Hall, Castella Street, Lilydale, commencing at 8.00pm.

For further information contact the Secretary, PO Box 176, Lilydale 3140. Tel: (03) 735 0638 B Vickers.

QLD

The Apple-Q User Group meets on the third Sunday of each month (excluding December) at the Hooper Centre, Kuran Street, Wavell Heights, commencing at 9.00am. Activities include interchange of information, guest speakers, and classes in M/L.

For further information contact the Secretary, R. Godbehere, PO Box 721, South Brisbane 4101. Tel: (07) 808 3892.

The Brisbane Sixteen Bit User Group (Brisbug) meets on the third Sunday of each month at the Toowong High School, Bywong Street, Toowong, commencing at 2.00pm. Activities include sharing information, distribution of public domain software, and helping each other.

For further information contact the President, Ian Patterson, PO Box 985, Toowong 4066. Tel: (07) 356 5891.

The Cairns Commodore User Group meets on the first and third Tuesday of each month at the Cairns Education Centre, commencing at 7.30pm. Activities include demonstrations and workshops. The group also maintains a public domain and book library.

For further information contact Ian Pearse, PO Box 7, Earlville 4870. Tel: (070) 54 4514.

The Commodore Computer User Group meets on the first Tuesday of each month (except January) at the Bardon Professional Development Centre, 390 Simpsons Road, Bardon, commencing at 7.30pm. Activities include suburban workshops.

For further information, write to PO Box 274, Springwood 4127. BBS 24 hours (07) 344 1833.

The CompuColour User Group meets on the third Saturday of each month at 325 Enoggera Road, Newmarket 4051, commencing at 1.30pm.

For further information contact Ray Halliday, 325 Enoggera Road, Newmarket 4051. Tel: (07) 356 4236.

The Gold Coast Atari User Group meets on the third Sunday of each month at the Southport State School, corner of Scarborough and Lawson Streets, commencing at 3.00pm.

For further information contact Allan Robinson, 42 12th Avenue, Palm Beach 4221. Tel: (075) 57 3632.

MSX Penpals communicate by mail (as the name suggests), exchanging programs on disk and tape.

For further information, contact Gordon Browell, 13 Brookes Street, Biggenden 4621. Tel: (071) 27 1524.

The Sharp User Group of Brisbane meets on the second Wednesday of each month at Graceville State School, Oxley Road, Graceville. Activities include instruction and use of Sharp computers, use of library facilities, publishing a monthly newsletter, and liaison with English groups.

For further information contact Bill Laidlaw, 51 Sandon Street, Graceville 4075. Tel: (07) 379 3457.

The University of Queensland Osborne User Group meets on the second Thursday of each month (except January) at the Psychology Department, University of Queensland, commencing at 7.00pm. Activities include maintenance of public domain software, education of members, maintenance of CPM section of bulletin board.

For further information contact Neal Ashkanasy, Commerce Department, University of Queensland, St Lucia 4067. Tel: (07) 371 4294.

SA

The Hitachi User Group is a special interest group of the SA Micro Processor Group. Meetings are held irregularly at various locations.

For further information contact Cliff Hignett, 45a Ormond Avenue, Daw Park 5041. Tel: (08) 276 7706.

The Microbee User Group of SA meets on the third Monday of each month at 18 Arthur Street, Unley, commencing at 7.30pm. Activities include support for CP/M and MS-DOS.

For further information contact the Secretary, PO Box 767, Adelaide 5001.

The South Australian Apple User Club (SAAUC) holds two meetings per month. The general meeting is held on the first Friday of each month at the rear of the Prospect Town Hall, commencing at 7.30pm. The Mac Special Interest Group meets on the third Friday of each month at the same venue. Activities include demonstrations, question and answer sessions, publishing a monthly newsletter, and a selection of public domain software is available.

For further information, contact the Secretary, Ian Bagust, PO Box 322, Prospect 5082. Tel: (08) 293 7183.

The Adelaide Atari Computer Club meets on the first Monday of each month (or second if it clashes with a public holiday) at Gilles Street Primary School, commencing at 7.30pm; and the

USER GROUPS

third Monday of each month at Modbury West Primary School, again commencing at 7.30pm. Activities include demonstrations, discussions, publishing a club magazine, maintaining a public domain and magazine library.

For further information contact the Secretary, Bob McEwin, PO Box 333, Norwood 5067. Tel: (08) 263 8854.

The Sorcerer User Group meets on the second Wednesday of each month at MAC Audio and Acoustical Consultants, 54-56 Goodwood Road, Goodwood. The group publishes a monthly newsletter, and provide a bulletin board service.

For further information contact the Secretary, Don Ide, 14 Scott Road, Newton 5074. Tel: (08) 260 6576.

WA

The Amicable User Group publishes a monthly newsletter containing software and hardware reviews, programming tutorials, general information and hints and tips.

For further information contact Stephen Strong, 41 Ford Road, Busselton 6280. Tel: (097) 52 4023.

The Amstrad Amswest User Group meets on the first and third Tuesday of each month at 238 Bagot Road, Subiaco. Activities include educating members to understand and operate Amstrad computers.

For further information contact Graeme Worth, 6/54 Central Avenue, Maylands 6051. Tel: (09) 341 5211.

The Australian QL User Association meets occasionally.

For further information contact Richard Czerwonka, 17 Tucker Street, Capel 6271. Tel: (097) 27 2361.

The Educational Computing Association of WA holds irregular meetings relating to use of computers in education and computer science.

For further information contact the Secretary, Drew Arbuckle, PO Box 10, Mt Lawley 6050.

The Microbee User Group of WA meets on the first Sunday of each month at the Leederville Technical College, commencing at 7.30pm. Activities include guest speakers, hardware and software hire.

For further information contact Ross Gould, GPO Box N1090, Perth 6001. Tel: (09) 417 1374.

ACT

The Canberra Compucolour Club meets irregularly, but serves as contact point for local and interstate users. The Club has considerable software and information on hardware mods and problems related to the Compucolour.

For further information, contact the convenor, Ken Kerrison, 5 Beltana Road, Pialligo 2609. Tel: (062) 47 6575.

The Canberra NEC User Group meets on the first Tuesday of each month at the Bureau of Meteorology, 84 Northbourne Avenue, Canberra, commencing at 7.30pm. Activities include lectures, discussions, monthly newsletter.

For further information contact the President, Brian Embury, PO Box 173, Belconnen 2616. Tel: (062) 59 1115.

The CUG User Group meets on the first and third Monday of each month (except January). Activities include various interest groups, bulletin board.

For further information contact Ken Shands, PO Box 599, Belconnen 2616. Tel: (062) 92 3087.

The PC User Group meets on the last Monday of each month at the Coombs Lecture Theatre, ANU Campus, commencing at 8.00pm. Activities include training courses, special interest groups, public domain software/hardware library, and publishing a monthly newsletter.

For further information contact the Secretary, Will Faithful, PO Box 2229, Canberra City 2601. Tel: (062) 58 7484.

TAS

The Southern Tasmanian Amstrad Club meets on the fourth Wednesday of each month at the Derwent Regional Library, Glenorchy. The group gives assistance to CPC and PCW owners.

For further information, contact Frank Self, PO Box 247, North Hobart 7002. Tel: (002) 49 5499.

Australia wide

The Amstrad All-Australia Postal Group correspond via monthly circulation of disk or cassette. Activities include discussion, tutorials, circulation of members own programs.

For further information contact Bob Siddon, Convenor, PO Box 1084, Bendigo 3550.

The Australia Amiga User Association meets monthly at various cell groups throughout Australia. They also hold a general meeting every quarter, and an annual open day. Activities include general assistance, publishing a newsletter, maintaining BBS.

For further information contact Ray Wilson or Mark Underwood, PO Box 389, Penrith 2750. Tel: (047) 51 4143 RW or (045) 77 5860 MU.

The GS User Group correspond through a regular newsletter. Activities include importing and distributing software and hardware.

For further information contact Terry Cass, PO Box 210, Wentworthville 2145. Tel: (02) 688 2701.

The Le'vz 200/300 OOP User Group corresponds via phone and mail. Members throughout South Pacific. They publish a newsletter and hold an expo in December.

For further information contact John Dalton, 39 Agnes Street, Toowing 4066. Tel: (07) 371 3707.

END

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NUMBERS

The fascinating topic of addition chains is explored by Mike Mudge.

Definition An 'Addition Chain' for a positive integer n is a finite sequence of positive integers:

$1 = a_0 < a_1 < a_2 < a_3 < \ldots < a_r = n$ where each member (other than $a_0 = 1$) is the sum of two earlier, but not necessarily distinct, members of the sequence.

Thus, two different addition chains for 14 are:

C_1: 1, 1 + 1 = 2, 2 + 2 = 4, 4 + 2 = 6, 6 + 2 = 8, 8 + 6 = 14

C_2: 1, 1 + 1 = 2, 2 + 2 = 4, 4 + 2 = 6, 4 + 4 = 8, 8 + 6 = 14

Each of these chains is said to have *length*, r = 5.

Definition The minimal length of an addition chain for n is denoted by L(n). A 'Brauer chain' is one in which a shortest chain exists where each member uses the previous member as a summand.

Note that C_2 above is not a Brauer chain because 4 + 4 = 8 does *not* use the previous term — that is, the 6 — but it is a minimal chain.

Any number n which has a Brauer chain is called a 'Brauer number'.

Definition An addition chain for which there is a subset H of the members, such that each member of the chain uses the largest element of H which is less than the member, is called a 'Hansen chain'.

Note that C_2 above is a Hansen chain with H = (1,2,4,8).

Donald Knuth, in *The Art of Computer Programming Vol 2* (Addison-Wesley 1969, pp 398-422) gives the following addition chain for 12509:

1, 2, 4, 8, 16, 17, 32, 64, 128, 256, 512, 1024, 1041, 2082, 4164, 8328, 8345, 12509.

This is *not* a Brauer chain since 32 does not use 17. However, it *is* a Hansen chain with H = (1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 1041, 2082, 4164, 8328, 8345).

No Brauer chain of length 17 or less exists for 12509.

A conjecture of Arnold Scholz (1937)

The minimal length of an addition chain for $2^n - 1$ differs from the minimal length of an addition chain for n by less than n.

$L(2^n - 1) \leq n - 1 + L(n)$.

A question of Richard Guy (1983)

Are there any numbers n which do not have Hansen chains? That is, are there any Non-Hansen numbers? Note the Scholz Conjecture has been proved for $n = 2^a$, $2^a + 2^b$, $2^a + 2^b + 2^c$ and $2^a + 2^b + 2^c + 2^c$ by Utz, Gioia *et al* (1953) and demonstrated for $1 \leq n \leq 18$ and n = 20,24 and 32 by Knuth & Thurber (1973/76).

Problems

(i) Construct a computer program to obtain all possible addition chains for a given n. The complete output should be generated only for certain small values of n for test purposes!

(ii) Modify the above program to list any Brauer and/or Hansen chains produced. In the latter case, the appropriate subset H should be output.

(iii) Establish the value of L(n) as a function on n and hence verify the Scholz conjecture, albeit for a small range of n.

(iv) Comment on the empirical evidence for the existence of Non-Hansen numbers.

Readers are invited to send their attempt at some, or all, of the above problems to Mike Mudge, C/-*APC* 124 Castle-reagh Street, Sydney 2000, to arrive by 19 August, 1988.

It would be appreciated if such submissions contained a brief description of the program and a summary of the results obtained in a form suitable for publication in *APC*.

These submissions will be judged using subjective criteria, and a prize will be awarded by *APC* to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a suitable stamped self-addressed envelope is provided.

Review: January 1988

Attempts to investigate the sequence directly are clearly doomed, x_{17} having 2661 digits. However, H Ibstedt determined that x_{42} with 89288343500 digits would, if printed 80 digits per line and 60 lines to a page, require more than nine million sheets of paper and weigh approximately 35000kg!

But the most comprehensive study was that of H Ibstedt whose results include the location of the first non-integer term for all powers up to the eleventh and initial values x_1 from 2 up to 11.

A very worthy prize-winner. The longest integer sequence of 600 terms occurs for cubes and $x_1 = 11$, while the shortest of 7 occurs several times in the above study.

END

Mike Mudge *welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or specific, for future Numbers articles; all letters will be answered in due course.*

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LAZING AROUND

Brainteasers courtesy of JJ Clessa.

Quickie

How much earth is there in a hole measuring 2 feet by 2 feet by 2 feet? The answer is *not* eight cubic feet.

Prize puzzle

A short and not too difficult problem in logic this month.

On the island of Asseic, there are only two tribes of inhabitants:

- The Luddites — who always tell lies.
- The Verities — who always tell the truth.

A visitor to the island sees four natives of Asseic walking down the street, and he asks if they are Luddites or Verities.

The first native says, "We're all Luddites." The second says, "Only one of us is a Luddite." The third says, "Two of us are Luddites." The fourth says, "I'm a Verity."

To what tribe did the fourth native belong?

Answers on postcards or backs of envelopes only, to reach the *APC* office no later than 31 July, 1988.

Send your entries to: Lazing Around July, *APC*, 124 Castlereagh Street, Sydney, 2000.

April prize puzzle

Alas, the April puzzle contained a typographical error. The word 'total' should have read 'product' — as many of you realised.

Anyway, the cost of the statue was $7 and the winning card, drawn at random from the correct entries, came from Mr Peter Sutton from St Lucia, Qld.

Congratulations, Mr Sutton — your prize is on its way.

To all other entrants — hang in there!

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